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Environmental Assessment

Sludge Stabilization at the Plutonium Finishing Plant, Hanford Site, Richland, Washington

U.S. Department of Energy
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ENVIRONMENTAL ASSESSMENT

SLUDGE STABILIZATION AT THE PLUTONIUM FINISHING PLANT

HANFORD SITE, RICHLAND, WASHINGTON

U.S. DEPARTMENT OF ENERGY

OCTOBER 1994

Glossary

Acronyms and Abbreviations

ARF	airborne release fraction
ASIL	Acceptable Source Impact Level
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EA	Environmental Assessment
Ecology	State of Washington Department of Ecology
EDE	effective dose equivalent
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FFTF	Fast Flux Test Facility
HEPA	High-Efficiency Particulate Air
LFL	lower flammability limit
LCF	latent cancer fatality
NESHAP	National Emission Standards for Hazardous Air Pollutants
PFP	Plutonium Finishing Plant
PRF	Plutonium Reclamation Facility
PUREX	Plutonium-Uranium Extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
rem	Roentgen Equivalent Man
RMC	remote mechanical "C"
TBP	tributyl phosphate
TLV-STEL	Threshold Limit Value - Short Term Exposure Limit
TLV-TWA	Threshold Limit Value - Time Weighted Average
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRUSAF	Transuranic Waste Storage and Assay Facility
WAC	*Washington Administrative Code*
WIPP	Waste Isolation Pilot Plant

Definition of Selected Terms

<u>Effective Dose Equivalent</u>. A value used for estimating the total risk of potential health effects from radiation exposure. This estimate is the sum of the committed effective dose equivalent from internal deposition of radionuclides in the body and the effective dose equivalent from external radiation received during a year.

<u>Latent cancer fatality</u>: The excess cancer fatalities in a population due to exposure to a carcinogen.

Definition of Selected Terms (cont.)

Maximally exposed individual. A hypothetical member of the public residing near the Hanford Site who, by virtue of location and living habits, could receive the highest possible radiation dose from radioactive effluents released from the Hanford Site.

Person-rem. A population dose based on the number of persons multiplied by the radiation dose.

Plutonium Finishing Plant. The Plutonium Finishing Plant, a complex of many buildings, mostly attached, that functioned to provide plutonium in various forms for defense purposes. In the past, the plant has also been referred to as the "Z Plant."

roentgen equivalent man (rem). A special unit of dose equivalent that indicates the potential for impact on human cells.The dose equivalent in rems is numerically equal to the absorbed dose in rads multiplied by the quality factor, the distribution factor, and any other necessary modifying factors.

Remote mechanical "C". Remote mechanical "C" line, historically the third planned metal processing line at the Plutonium Finishing Plant.

Sludge. A muddy or slushy mass, deposit, or sediment such as a precipitated solid matter or a precipitate or settling in liquid (such as a mixture of impurities and acid).

Transuranic waste. Without regard to source or form, radioactive waste that at the end of institutional control periods is contaminated with alpha-emitting radionuclides of atomic numbers greater than 92 with half-lives greater than 20 years and concentrations greater than 100 nCi/g.

Scientific Notation Conversion Chart

Multiplier	Equivalent	Multiplier	Equivalent
10^6	1,000,000	10^{-1}	0.1
10^5	100,000	10^{-2}	.01
10^4	10,000	10^{-3}	.001
10^3	1,000	10^{-4}	.0001
10^2	100	10^{-5}	.00001
10^1	10	10^{-6}	.000001
10^0	1	10^{-7}	.0000001
		10^{-8}	.00000001

Metric Conversion Chart

If you know	Multiply by	To get	If you know	Multiply by	To get
Length					
centimeters	0.393	inches	kilometers	0.62	miles
meters	3.2808	feet	cubic meters	35.34	cubic feet
Area					
square kilometers	0.39	square miles	square centimeters	0.1550003	square inch
Mass (weight)					
grams	0.0022	pounds	grams	0.035	ounces
kilograms	2.2046	pounds			
Volume					
liters	0.26	gallons	cubic meters	35.3147	cubic feet
Temperature					
Celsius		multiply by 9/5ths, then add 32		Fahrenheit	

Source: *CRC Handbook of Chemistry and Physics,* Robert C. Weast, Ph.D., 70th Ed., 1989-1990, CRC Press, Inc., Boca Raton, Florida.

Executive Summary

This Environmental Assessment evaluates the proposed action to operate two laboratory-size muffle furnaces in glovebox HC-21C, located in the Plutonium Finishing Plant (PFP), Hanford Site, Richland, Washington. A muffle furnace is a type of small electric radiant oven. The cavity is surrounded by fire brick to separate the material being dried from the heating elements. The muffle furnaces would be used to stabilize chemically reactive sludges that contain approximately 25 kilograms (55 pounds) of plutonium by heating to approximately 500 to 1000 °C (900 to 1800 °F). The resulting stable powder, mostly plutonium oxide with impurities, would be stored in the PFP vaults.

The presence of chemically reactive plutonium-bearing sludges in the process gloveboxes poses a risk to workers from radiation exposure and limits the availability of storage space for future plant cleanup. Therefore, there is a need to stabilize the material into a form suitable for long-term storage. This proposed action would be an interim action, which would take place prior to completion of an Environmental Impact Statement for the PFP which would evaluate stabilization of all plutonium-bearing materials and cleanout of the facility. However, only 10 percent of the total quantity of plutonium in reactive materials is in the sludges, so this action will not limit the choice of reasonable alternatives or prejudice the Record of Decision of the Plutonium Finishing Plant Environmental Impact Statement.

The sludge stabilization process would consist of relocating sludge containers from the Plutonium Reclamation Facility to Room 230A and into glovebox HC-21C, pouring the material into a boat (crucible) for heating, and weighing the full boat. After weighing the boat, it would be placed into one of the furnaces, and the furnace temperature controller would be programmed to slowly heat the sludges. The heating cycle would vary depending on the composition of the sludges. During the heating process, plutonium compounds would be converted to plutonium oxide, and any excess moisture would be driven off. After heating, the furnace would be allowed to cool, then the stabilized material would be removed from the furnace, transferred to another glovebox, sieved, and analyzed for stability. Other routine operations may be performed on the material, such as hand grinding the residues in order to prepare the material for storage. If acceptable, the material would be repackaged and removed from the glovebox for storage. Material that does not meet storage acceptance criteria would be recycled through the stabilization process.

Completion of sludge stabilization would require about 400 to 600 batches. The uncertainty is due to the assumed recycle rate and other factors. It is estimated that the process would average two batches, per furnace, per day. Each batch would be limited to less than 500 grams (1.1 pounds) of material per batch, and less than 2 percent organic composition. The stable, impure plutonium oxide would be packaged in approximately 150 1-liter (0.264-gallon) containers, and stored in the PFP storage vaults awaiting future disposition. There is sufficient capacity in the vaults to accept this material.

The No-Action alternative to the proposed action would be to not process the sludges. The sludges would continue to be stored in the gloveboxes. This would not accomplish the purpose for this proposed action.

Another alternative to the proposed action would be to discard the sludges as waste, although this alternative is not permitted under current rules. The sludges would be combined with a cement-like material which would be packaged in waste drums. Approximately 250 208-liter (55 gallon) drums of contact-handled transuranic waste would be generated from the sludges. The drums would be stored in Hanford Site waste facilities, until a final repository was available.

Another alternative considered several processing alternatives that would stabilize the sludges. These processing operations include operating the Plutonium Reclamation Facility (PRF) or vitrifying the sludges. These alternatives are viable; however, the PRF process is similar to historical defense production processes; in some instances (i.e., vitrifying), make the processed material incompatible for future disposition; and would expose the operating staff to substantially higher doses of radiation.

Operation of the furnaces under the proposed action would produce low levels of radiological air emissions due to the furnace offgas. The offgas would be filtered twice prior to exiting the plant stack. After passing through the filtration, the total plant emissions would not be measurably increased above current levels. The estimated health effect to the public from total plant emissions has historically averaged about 0.00005 latent cancer fatality (LCF) per year (0.1 Roentgen Equivalent Man [rem] per year) for the population within 80 kilometers (50 miles) of the PFP. No fatal cancers are expected to be attributable to this exposure.

The process would generate small amounts of gaseous butene, nitrogen oxides, carbon dioxide and water. The resulting maximum onsite and offsite concentrations from continuous emission of these chemicals out the plant stack would be a factor of 10^6 or lower than any applicable health standards.

Approximately 0.01 cubic meters (0.5 cubic feet) of solid waste, per day, would be generated from disposal of storage containers and normal operational waste such as glovebox sealouts and lab analyses.

Workers would be exposed to radiation when they perform stabilization operations in proximity to the sludges at a composite rate of about 10 millirem per hour. The process is expected to require about one hour each of close proximity work per shift for three workers, which would result in a cumulative dose of 17 person-rem for the stabilization operation. This dose could result in an estimated health effect of 0.007 LCF (17 rem) for the workers as a result of the stabilization operation. No fatal cancers are expected to be attributable to this exposure. No physical impact would result outside the plant from the postulated accident.

The bounding accident postulated for this operation was determined to be a flammable gas (butene) deflagration inside the glovebox, which breaches the glovebox, and disperses 126 grams (0.28 pounds) of plutonium into the room. The probability for this accident is estimated to be less than 0.00001 occurrences per year. This postulated accident could result in 0.048 grams (0.001 pounds) of plutonium released from the plant stack which would have a health effect of 0.0015 LCF (3.75 rem) to the 140 exposed onsite population and

0.011 LCF (22 rem) to the 114,734 exposed offsite population. No offsite or onsite population fatal cancers are expected to be attributable to this exposure.

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1.0 Purpose and Need for Agency Action

The DOE needs to reduce worker exposure to radiation at the PFP. Currently, the PFP workers account for nearly half of all Hanford Site radiation exposure. One of the largest sources of worker exposure in the plant that can be decreased is the constant need for proximity to unshielded gloveboxes containing sludges in order to monitor the conditions of sludge containers, to inventory material, and to perform routine housekeeping and preventative maintenance operations. Radioactive decay products (mainly americium-241) build up in stored plutonium. These decay products in the sludges cause increased worker radiation doses. This dose can be reduced incrementally as the sludges are stabilized and moved to vault storage.

The DOE also needs to increase available shielded glovebox storage space for reactive residues. Sludges occupy the majority of the shielded glovebox space, which would be required for future actions to clean up plutonium-contaminated portions of the plant. Planned future cleanup activities include cleanout of ventilation ducts, filter boxes, access bays, and other areas of the PFP.

In the past, the Plutonium Finishing Plant (PFP) was used to process plutonium-based chemicals to produce pure plutonium metal or oxide. The U.S. Department of Energy (DOE) then shipped these products offsite to be used in the nation's weapons program. The last production operations were conducted in 1989. Reactive scrap materials remain in the process areas of the facility, including plutonium-bearing sludges, process solutions, and other materials.

1.1 Background

The PFP began operations in 1949 to convert plutonium nitrate solutions into plutonium metal. This activity continued in various campaigns through 1988. As a result of the conversion process, a number of scrap forms of material were generated, some of which could not be immediately recycled into the process and thus required storage. The shielded and secure vaults were designed to store these materials in sealed storage containers located in Building 2736-Z (Figure F-3). Sealed storage requires the removal of any gas-forming compounds. If such compounds are not removed, sufficient gas to pressurize individual storage containers can be evolved leading to their rupture and a release of plutonium into the vaults. The gas is generated primarily from chemically active compounds and the radiolysis of hydrogen-bearing compounds. Historically, such compounds have been processed (i.e., "stabilized") by heating them in a small furnace to high temperatures. This effectively drove off water and decomposed organic or other molecules to gaseous forms. The resulting residues were canned to seal out moisture and contain the plutonium.

Stabilization operations were halted in 1989 due to concerns about ignition of flammable gas generated in the stabilization process after many years of uneventful processing. If a sufficient quantity of flammable gas had been generated and ignited, the glovebox could be breached and plutonium could be released into the surrounding room (i.e., room 235C).

To reduce the likelihood of a flammable gas deflagration and to mitigate any attendant consequences, new furnaces with improved flammable gas control have been installed in glovebox HC-21C. Glovebox HC-21C is located in room 230A. This room, as well as adjoining rooms and corridors, is serviced by a ventilation system equipped with High-Efficiency Particulate Air (HEPA) filters. Should process safety features be compromised, these filters would remove, at a minimum, 99.95 percent of the plutonium entrained in the air.

The proposed action includes operation of two laboratory-scale muffle furnaces (electric radiant ovens) in a glovebox.[1] Minor modifications will be made to piping inside the glovebox and in room 230A. Piping modifications include running a carbon dioxide (CO_2) gas purge to each furnace and running an offgas removal line from each furnace. A control console will be installed in room 230A for furnace temperature readouts and controls.

Stabilizing the sludges would allow the materials to be stored in well-shielded vaults where they would be remotely monitored and would require less handling during inventory. It is estimated that this would reduce worker exposure for all PFP operators by 4 rem per year. This would result in less worker exposure and less risk of accidental contamination.

In July 1993 an EA was initiated to review operation of the major PFP processes to stabilize most of these sludges along with process solutions and other scrap materials. However, DOE decided to increase the level of *National Environmental Policy Act of 1969* review to that of an Environmental Impact Statement (EIS). The scope was expanded to review reasonable alternatives for the stabilization of all plutonium bearing materials, cleanout of the PFP facilities (except for storage) to a state ready for decontamination and decommissioning (D&D), and/or potential future uses. Publication of the Notice of Intent is expected on October 27, 1994.

This action to stabilize the sludges in the gloveboxes would be an interim action pending completion of the PFP EIS analysis and Record of Decision concerning the proposed cleanout of the PFP and stabilization of the remaining materials within the PFP. This need is being addressed now because the sludges now in unshielded gloveboxes are a large source risk of worker exposure due to the need for constant handling, which may be easily reduced. Additionally, the sludges also occupy the majority of the shielded glovebox space required for any future actions to clean up plutonium contaminated portions of the plant. However, only 10 percent of the total quantity of plutonium in reactive materials at the PFP is in the sludges, so this action will not limit the choice of reasonable alternatives or prejudice the Record of Decision.

[1]A muffle furnace uses a barrier to separate a batch of material from the heating elements. In principle, the furnace operates similarly to a pizza oven.

2.0 Description of the Proposed Action

The proposed action would be to stabilize the chemically reactive plutonium-bearing sludges within both unshielded and shielded gloveboxes in the PFP. These sludges are residues remaining from previous production processing operations at the PFP. These sludges contain approximately 25 kilograms (55 pounds) of plutonium along with other chemicals in a slurry with high moisture content. The total quantity of plutonium in the sludges is approximately 10 percent of the total quantity of plutonium in all the reactive materials stored at the PFP. The remaining 90 percent of the reactive materials in the plant is primarily in residual process solutions; stabilizing these solutions is not within the scope of this Environmental Assessment (EA).

Specifically, the proposed action would consist of the following activities.

2.1 Sludge Stabilization

The DOE proposes to stabilize certain plutonium-bearing sludges by heating the sludges to approximately 500 to 1000°C (900 to 1800°F), which will convert the plutonium in the sludges to stable plutonium oxide (PuO_2). The other chemicals not driven off by the heat would remain as stable impurities in the resulting solid. This solid could be stored in a sealed container in the vaults at the PFP. The reactive scrap sludges will occupy approximately 300 containers which require stabilization; these contain a total of about 25 kilograms (55 pounds) of plutonium.

The process would use two 4000-watt laboratory-size muffle furnaces installed in glovebox HC-21C located in room 230A of building 234-5Z within the PFP. This stabilization process has been operated in the past at the PFP using an older furnace design in glovebox HA-21I in room 235C.

2.2 Process Description

The feed materials for sludge stabilization would consist of sludges from the last Plutonium Reclamation Facility (PRF) campaign, the PRF training run, and miscellaneous glovebox floor sweepings from the RMC line, consisting primarily of plutonium oxalate that has transformed to plutonium oxycarbonate[2] and partially converted plutonium oxide. The composition of PRF sludges is presented in Table 1. The composition of the RMC line plutonium oxycarbonate is presented in Table 2.

[2] Plutonium oxalate ($Pu(C_2O_4)_2$) degrades to plutonium oxycarbonate ($PuOCO_3 \bullet 2H_2O$) with a reaction half-life of 64 days. Given that the RMC line sweepings have been in storage in excess of 4 years, essentially all of the plutonium oxalate has degraded to the oxycarbonate form. Whereas the heating of oxalate in the absence of oxygen generates carbon monoxide (a flammable gas), heating of oxycarbonate generates primarily less hazardous carbon dioxide and water.

**Table 1.
Plutonium Reclamation Facility Sludge Composition.**

Compound	Weight Percent		
	Min	Max	Ave
Fe_2O_3 and $Fe(NO_3)_3$	0	50	33
CCl_4	0	1	0
Tributyl Phosphate	0	2	1
$Pu(NO_3)_4$	0	39	26
PuO_2	0	10	7
3-5 M HNO_3-H_2O	0	50	33

**Table 2.
Remote Mechanical "C" Line Plutonium Oxycarbonate Composition[3].**

Compound	Weight Percent
$PuOCO_3 \cdot 2H_2O$	94.5
HNO_3	1.1
$H_2C_2O_4$	trace
H_2O	4.4

The sludges would be relocated from their various current storage locations (unshielded PRF and RMC gloveboxes, the PRF canyon, and the shielded HA-23S storage glovebox). This would require movements in and out of gloveboxes. Material would be packaged and sealed out of gloveboxes. Sealing is a routine operation to safely place material in or out of a glovebox in a manner that prevents any external contamination from radioactive material. Specifically, material is removed from the glovebox through a tubular plastic bag which is then sealed in a manner similar to that of a home food sealer. Material would be sealed in and out of glovebox HC-21A, which is connected to HC-21C, during stabilization. After the stabilization process, the impure plutonium oxide would be placed in appropriate vault containers, transported and stored in an existing storage vault for future disposition. There is sufficient capacity in the vaults to accept this material. During vault storage the containers would be remotely monitored to detect any changes such as container bulging. The vaults are shielded to minimize worker exposure. The material would be periodically inspected and inventoried to verify its safe condition.

The stabilization process would take place in glovebox HC-21C. Some ancillary routine operations, such as sieving, grinding, and sealing in and out, may take place in glovebox HC-21A which is connected to HC-21C via a conveyor. The plutonium-bearing

[3]Assumes conversion of all oxalate to oxycarbonate.

sludges would be unpackaged and crushed if necessary. The waste packaging would be sealed out of the glovebox and disposed. The sludges would be poured into flat, low-volume boats (crucibles) for heating. The boats are designed to hold roughly 1,000 grams (2.2 pounds) of sludge but the charge would be limited to 500 grams (1.1 pounds). The extra volume would be provided to reduce the chance of spillage during processing and handling.

The gross weight of the material and boat would be recorded. The boat would then be placed into one of the furnaces. The ventilation air flow would be started. If the material could potentially contain tributyl phosphate (TBP) or its degradation products, a flow of inert cover gas, such as carbon dioxide, would be introduced into the furnace. The inert cover gas would reduce the potential for ignition of any gaseous products generated. After the material has reached approximately 300°C (572°F) and any potentially combustible gaseous products have been driven off, the flow of inert cover gas would be stopped, to allow the material to stabilize.

The temperature controller would be programmed for the material to be processed. The temperature controller regulates the heating cycle, which involves raising and maintaining of the furnace temperature for a specific period of time. The furnaces would heat up slowly to about 180°C (356°F) to drive off combustible gaseous products. The material would then be raised to higher temperatures and held there for a period of time to stabilize the material (For example, 760°C [1400°F] for 2 hours). Specific heating regimes would be dependent on the composition of the material being processed. For example, a different cycle would be used for RMC glovebox floor sweepings than for PRF sludges.

As the sludges are heated, water vapor, carbon dioxide, butene and nitrogen oxide compounds would be released in gaseous form through the glovebox ventilation system. The butene would result from decomposition of the organic compounds, primarily tributyl phosphate. The nitrogen oxide compounds result from decomposition of nitric acid and plutonium nitrate. The remaining product would be a stable, dry, impure plutonium oxide powder.

After the heating cycle is completed, the furnace would be allowed to cool. After cooling, the material would be removed from the furnace, weighed, sieved and broken up (if necessary), and sampled for stability. The material would be sampled to determine if any moisture remains or has been absorbed into the dried material. The larger pieces that do not go through the sieve would be crushed if necessary and recycled through the furnace. Material which does not meet vault storage stability requirements would also be recycled through the process. If the material meets acceptability criteria it would be repackaged and removed from the glovebox and placed in the PFP vaults.

The second furnace would be operated using the same process. The two furnaces may be operated concurrently or in alternating cycles.

The sludges to be stabilized would occupy approximately 300 containers (ventilated half liter [1 pint] polyjars). Each batch would be limited to 500 grams (1.1 pounds), which will require splitting of full polyjars into two batches.[4] The polyjars would contain varying amounts of sludge, and some (perhaps 20 percent) material may have to be recycled through the furnace. Based on these factors an estimated 400 to 600 batches would need to be processed to complete stabilization of the sludges. The process is expected to average one to two batches per furnace per day.

The feed would also be limited to material with less than 2 percent organic composition, primarily tributyl phosphate. During the stabilization process, decomposition of the tributyl phosphate generates butene gas. Other gases generated by the process include nitrogen oxides (NOx), carbon dioxide and water. Each container of sludge proposed for processing will be tested before stabilization; only those containing less than 2 percent organics will be stabilized.

2.3 Facility Description

2.3.1 Plutonium Finishing Plant

The PFP is located in the 200 West Area of the Hanford Site (Figures 1 and 2). Sludge stabilization operations would be conducted in glovebox HC-21C located in room 230A of the 234-5Z Building. The 234-5Z Building is the largest of several buildings comprising the PFP.

Several PFP utilities and services would support sludge stabilization operations. The most important of these are the E-3 and E-4 ventilation systems and the fire protection system.

All buildings served by the PFP ventilation system are zoned to ensure confinement of radioactive materials. Within Building 234-5Z, Zone 1 is designated as those areas where plutonium contamination would not normally be present. Zone 3 (there is no Zone 2) consists of areas in which plutonium is stored or handled in contained form, and where there is potential for contamination to occur. Zone 4 consists of the inside of hoods, gloveboxes, and process cells, directly exposed to plutonium, and which may be grossly contaminated. Differential pressures are maintained between zones to ensure that airflow is from areas of lowest to highest contamination potential.

The air from Zone 3 rooms and corridors (including room 230A and adjacent corridor) is filtered through a single stage of testable HEPA filters located in seven filter rooms, any three of which may be in normal service and the remainder in standby. The exhaust air from the filter rooms (approximately 4,560 m^3/min [161,000 ft^3/min]) flows into an exhaust plenum and is discharged to atmosphere via the 61-meter (200-foot) tall 291-Z-1 stack.

Exhaust from Zone 4 areas (including gloveboxes HC-21C and HC-21A and the vacuum system) is routed to a single stage of testable HEPA filtration with individual filters,

[4]Plutonium is much denser than water (500 grams has a volume of approximately one quarter of a liter).

or several filters operated in parallel, located on the duct level (or second floor) of the 234-5Z Building. Exhaust from these filters is routed to the E-4 filter rooms that provide a second stage of testable HEPA filtration. The E-4 ventilation exhaust is combined with the E-3 exhaust downstream of the filters and discharged to atmosphere via the 291-Z-1 stack. The E-4 system exhaust flow is approximately 1,048 m^3/min (37,000 ft^3/min).

The PFP fire protection system consists of many individual communication and operating systems that inform or provide action in regard to fires and fire fighting. The system includes:

- Fire alarm systems, which notify the fire department

- Heat or products of combustion detector systems that activate an alarm and/or activate a water, dry chemical, or halon fire suppression system (the RMC gloveboxes is the only area where halon is used).

- Fire barriers to isolate parts of buildings, thus slowing progress of fire and reducing damage. Such barriers are also vital to life safety.

2.3.2 Room 230A and Room 230B

Glovebox HC-21C is located in room 230A; one of a series of rooms in zone 3 that are located in an interior concrete shell that houses the remote mechanical "C" (RMC) line of processing gloveboxes (Figure 3). Room 230A is 7.9 meters (26 feet) north to south, 6.7 meters (22 feet) east to west and has a 4.9-meter (16-foot) ceiling height. The north and south walls of the room are 20-centimeter (8-inch) thick concrete that extend upwards to enclose that portion of the building's duct level that serves the RMC-line. The east and west walls are made of roof decking. The ceiling is made of 2-centimeter (0.75-inch) thick plaster on wire lath. Two doors lead from room 230A into room 228C on the east, two doors lead to room 230B on the west (one double door on the main floor and one on a partial mezzanine), and a double door opens into Corridor 6.

Glovebox HC-21A, located in Room 230B, is 3.25 meters (10 feet, 8 inches) long and 1 meter (3 feet, 3 inches) wide at the base. The top is 0.9 meter (3 feet) above the glovebox floor. The glovebox rests on an open framework such that the floor of the glovebox is approximately waist high to an operator standing on a metal platform. Slanted windows on the west side give operators better visibility. Lights are mounted outside the top window on the glovebox; windows on the east side provide additional light and visibility. An opening in the north end of the glovebox provides access to conveyer glovebox HC-2. Air is supplied from the conveyer and exhausts through a duct in the ceiling of glovebox HC-21A into the E-4 ventilation system.

Other equipment located in rooms 230A and 230B includes a portion of glovebox HC-2. Glovebox HC-2 is a conveyor that extends into and beyond adjacent rooms 228C and 230C. Utilities and services provided to room 230A include electrical power, fire protection (wet sprinkler system), and E-3 and E-4 ventilation. Figure 4 shows the location of glovebox HC-21C in room 230A and glovebox 230B in room 230B.

2.3.3 Glovebox HC-21C

Glovebox HC-21C is 3.25 meters (10 feet, 8 inches) long and 1 meter (3 feet, 3 inches) wide at the base with the top 0.9 meter (3 feet) above the glovebox floor. The glovebox rests on an open framework such that the floor of the glovebox is approximately waist high to an operator standing on a metal platform. Slanted windows on the east side give operators better visibility. Lights are mounted outside the top window on the glovebox, while windows on the west side provide additional light and visibility. An opening in the north end of the glovebox provides access to conveyer glovebox HC-2. The conveyer extends from Glovebox HC-18BS in room 228C to near Glovebox HC-60 in room 230C. Air is supplied from the conveyer and exhausted through a duct in the ceiling of Glovebox HC-21C into the E-4 ventilation system. A halon fire suppression system services the glovebox. This system is set to activate at an air temperature of 74 °C (165 °F).

Glovebox HC-21C houses two standard laboratory size 4,000-watt muffle furnaces. The outside of the furnaces measure 46 centimeters wide by 40 centimeters high by 61 centimeters deep (18 inches wide by 15.5 inches high by 24 inches deep). The furnace chambers inside measure 14 centimeters wide by 13 centimeters high by 33 centimeters deep (5.5 inches wide by 5 inches high by 13 inches deep). A muffle furnace is heated by electric elements surrounding the chamber, which is faced with firebrick to separate the contents from the elements. Heating is controlled by electronic controllers that slowly ramp the heat up to the required temperature. The controllers have high and low deviation logic systems that monitor process temperature in the furnace and remove power from the furnace if this temperature falls outside the expected range. Temperature detectors mounted in the glovebox would be connected to the controllers to prevent the glovebox from reaching the temperature that activates the fire suppression system. Offgases would be drawn off the furnace, using the building vacuum system, through an approximate 1-centimeter (0.50-inch) diameter tubing, cooled and then passed into the E-4 ventilation system. Carbon dioxide or inert gas would be piped into the furnaces at a rate of 0.8 to 1.6 meter^3 per hour (30 to 60 feet^3 per hr during part of the heating cycle to reduce the potential for flammability of the offgases during processing. The inert gas flow would cease when gaseous products are no longer generated, at about 300 °C (572 °F).

3.0 Alternatives to the Proposed Action

3.1 No-Action Alternative

The No-Action Alternative consists of not stabilizing the plutonium-bearing sludges at this time. The sludges would remain in unshielded process gloveboxes. The workers would continue to receive radiation doses during required glovebox operations such as monitoring the condition of the containers, accounting of the material, routine housekeeping, and preventative maintenance. All the PFP workers would continue to receive approximately 4 person-rem per year from the presence of sludges in unshielded gloveboxes.

In addition, shielded glovebox space would not be available for ventilation duct cleanout. It is estimated that cleaning out the ventilation ducts would reduce worker exposure for PFP workers approximately 4 person-rem per year (Ehlert 1993). Both of these activities would reduce PFP worker exposure 8 person-rem per year. The No-Action Alternative corresponds to 0.004 LCFs per year for the PFP workers until both cleanup actions occur. The No-Action Alternative would not meet the dual need of reducing worker exposure and of increasing shielded glovebox storage space to support future cleanup activities.

3.2 Disposal Alternative

The disposal alternative would dispose of the sludges as a retrievable waste form before a final decision has been made regarding the ultimate disposition of plutonium-bearing materials. Disposal of this amount and class of material is not allowable according to DOE Order 5633.3A, *Control and Accountability of Nuclear Materials* (DOE 1993b). This type of plutonium-bearing material requires safeguards to prevent unauthorized diversion or theft. In accordance with the referenced Order, this category of material is also not eligible for disposition as waste unless a vulnerability assessment demonstrates that there is not a risk of diversion or theft. However, if allowable the most likely disposal process for these solid sludges would be to cement the solids in a form that meets Waste Isolation Pilot Plant (WIPP) disposal criteria.

The process would involve diluting the materials, mixing them with a concrete-type of material, and then pouring the mixture into 0.5-liter (1-pint) containers. The containers would then be packaged into 208-liter (55-gallon) drums for storage. The current WIPP limit for plutonium stored in a drum is 100 grams (0.22 pounds) per drum. Disposal of the sludges would generate approximately 250 drums of waste.

Cementing the sludges would result in about 5 person-rem for the workers to cement the sludges and package the containers into 250 drums. This would result in 0.002 LCFs among the workers.

These 250 drums would be stored in one of two facilities (Central Waste Complex [CWC] or Transuranic Waste Storage and Assay Facility [TRUSAF]) on the Hanford site until WIPP starts accepting wastes. The interim storage location of these drums would be based on the curie content and security classification of the waste in the drum.

The total volume of the waste is relatively small. However, because of its high curie content, this waste would consume approximately 60 percent of the total waste storage capacity for allowed radionuclides within the CWC. The TRUSAF does not have a curie limit, and has sufficient space to accept the 250 drums (total capacity about 2,000 containers). Both facilities are operating in interim status under the Resource Conservation and Recovery Act (RCRA) of 1976 and *Washington Administrative Code* (WAC) 173-303. The waste created from the sludge would use a large proportion of the capacity of either the CWC (60 percent) or TRUSAF (12.5 percent) while awaiting the opening of the WIPP. In addition, current DOE directives do not allow this amount and classification of special nuclear material to be stored in TRUSAF or the CWC. For these reasons, this alternative is not desirable.

3.3 Processing Alternative

There are several processing alternatives that would stabilize the sludges and free up glovebox space. These include operating the PRF and vitrifying the sludges. Some of these alternatives are viable; however, they are more expensive; are similar to historical defense production processes at PFP; in some instances, would make the processed material incompatible for future disposition; and would expose the operating staff to substantially higher doses of radiation (Vogt 1994). The sludges would still need constant handling with the accompanying worker exposure while a process is developed and prepared. For these reasons the alternatives would not meet the immediate need of reducing worker exposure.

3.4 Offsite Treatment and Storage of Sludges Alternative

The Offsite Treatment and Storage of Sludges alternative would involve transporting the sludges to an offsite facility for treatment and disposal. However, existing regulations prohibit offsite transport of unstabilized fissile materials. Also the transportation of this material on public roads would require packaging not yet developed to meet transportation requirements (49 CFR 173.416 and 173.417). Accordingly, this alternative has been dismissed from further consideration.

4.0 Affected Environment

This section provides a description of the environment on the Hanford Site and the area surrounding the PFP complex.

4.1 Plutonium Finishing Plant Complex

The PFP complex houses a number of operations involved in the recovery and chemical conversion of plutonium. These operations include laboratories, plutonium processing, waste treatment, and nuclear material management. The complex is located within a secured area in the 200 West Area of the Hanford Site.

4.2 Location and Regional Population

The Hanford Site covers approximately 1440 square kilometers (560 square miles) in southcentral Washington State (Figure 1). The City of Richland is the nearest population center and adjoins the southernmost portion of the Hanford Site boundary. Richland is about 40 air kilometers (25 air miles) from the PFP. The population within 80 kilometers (50 miles) of the Hanford boundary is estimated to be 380,000 to 400,000 based on the 1990 census.

4.2.1 Regional and Site Activities

Other government facilities on the Hanford Site include: the shutdown N Reactor, the deactivated Plutonium-Uranium Extraction (PUREX) plant, U Plant, waste management facilities, nuclear materials storage facilities, research laboratories, and the Fast Flux Test Facility (FFTF). There are also eight retired production reactors and three retired irradiated materials processing plants on the site.

Commercial use of the Hanford Site includes a nuclear power plant operated by Washington Public Power Supply System and a low-level radioactive waste burial area operated by U.S. Ecology and administered by the State of Washington. The Siemens Nuclear Power Corporation fuel fabrication plant is adjacent to the southern boundary of the site.

Agriculture is the main industry within a 80-kilometer (50-mile) radius of Hanford. Other industries include a meat packing plant, food processing facilities, a fertilizer plant, a pulp and paper mill, a chemical plant, hydroelectric dams, and various small manufacturing firms.

4.2.2 Physical Environment

The Hanford Site is located in the Pasco Basin, one of the structural and topographic basins of the Columbia Plateau. The region is semiarid and consists of clusters of industrial buildings that are widely separated by large areas of undeveloped land, including abandoned agricultural areas. Plant and animal species are representative of those inhabiting the sagebrush-grass region of the northwestern United States (PNL 1992a).

The Columbia River flows through the northern part of the Hanford Site and along the eastern boundary. Grade level at the PFP complex is more than 60 meters (200 feet) above the maximum probable flood which is well above the 100- or 500-year flood. The PFP complex is not located in a wetland or a floodplain.

The only surface waters present in the 200 West Area are temporary waste water ponds and ditches. This water either enters the groundwater or evaporates.

Groundwater under the Hanford Site is present in both unconfined and confined conditions. The unconfined aquifer is contained within the Ringold Formation. Its sources of natural recharge are rainfall and run-off from the higher bordering elevations, water infiltrating from small ephemeral streams, and influent river water. Confined aquifers consist of sedimentary interbeds and interflow zones that occur between dense basalt flows in the Columbia River Basalt Group. Groundwater at the 200 West Area is between 55 to 95 meters (180 to 310 feet) below grade and is routinely monitored by the Pacific Northwest Laboratory.

The Hanford Site lies in a Zone 2 seismic area which implies a potential for moderate damage from an earthquake. The largest earthquake of record to occur within the Columbia Basin, the 1936 Milton-Freewater earthquake, had a magnitude of 5.75 on the Richter Scale.

The regional climate is characterized by relatively cool, mild winters and warm summers. Average minimum and maximum temperatures for January are -5° and 3°C (22° and 37°F). July's average low and high temperatures are 16° and 33°C (61° and 91°F). Average annual rainfall is 15 centimeters (6 inches) and the average annual evaporation rate is 135 centimeters (53 inches).

Prevailing winds are from a northwesterly direction. Tornadoes rarely occur in the region. The few that have been sighted were small and did not cause any damage. The probability of a tornado hitting a particular structure on the Hanford Site is about 1 chance in 100,000 years. Airborne particulate concentrations can reach relatively high levels in eastern Washington because of exceptional natural events such as dust storms and large brush fires.

Atmospheric dispersion conditions of the area vary between summer and winter months. The summer months generally have good air mixing characteristics. If the prevailing winds from the northwest are light, less favorable dispersion conditions may occur. Occasional periods of poor dispersion conditions of stagnant air occur during winter months.

The immediate area within a security fence surrounding the PFP is under vegetation control and is sprayed with herbicide at least annually to control noxious weeds. The only vegetation present is a lawn surrounding an administrative building. Robins, western kingbirds, barn swallows, starlings, and cottontails have been observed in the immediate area.

The 200 West Area near the PFP, outside of the security fence, is mostly sagebrush habitat consisting of scattered shrubs with understory of cheatgrass and sandberg's bluegrass, with a large ricegrass component. Bird species observed in the vicinity include horned lark, western meadowlark, Say's phoebe, rock dove, and starling. Coyotes and rabbits have been observed in the area.

4.3 Cultural Resources

The proposed action will not have any impact on cultural resources. All activities will take place in an existing facility. In addition, no modifications of the building are required. The installation of muffle furnaces in Glovebox HC-21C is not considered a Federal undertaking, as defined in 36 CFR Part 800. The planned operation will not affect the historical integrity of the facility if it is determined to be eligible for the National Register of Historic Places. See Appendix C for the cultural resources determination.

5.0 Environmental Impacts

Environmental impacts from routine operations and potential accidents are discussed below. There are no project construction-related impacts because operations will take place within the existing facility. Minor modifications are required to place furnaces and ancillary equipment in existing gloveboxes.

5.1 Air Emissions

Some chemical and radiological air emissions would be produced from the furnace offgas. The following sections discusses the impacts from these.

5.1.1 Radionuclide Air Emissions

Offgas would be exhausted from the furnaces using the plant process vacuum system. This offgas would contain small concentrations of suspended radionuclide particles, primarily plutonium oxide, from the stabilization process. The offgas pollution control system includes a sintered metal filter at the exit of the furnace to remove the large particles. The offgas would then enter the E-4 ventilation system which includes two stages of HEPA filtration. Each stage of HEPA filtration removes at least 99.95 percent of the remaining 0.3 micrometer or larger radionuclide particles passing through them. The offgas would contribute a very small percentage (approximately 0.05 percent) to the total plant exhaust flow.

The radionuclide emissions resulting from operation of the furnaces are expected to be extremely low after passing through the two HEPA filters and would not result in a detectable increase in total plant emissions. Historically, the total plant emissions have not varied significantly with different operations in process, including previous furnace stabilization operations. The total plant emissions result from continuous ventilation of all the process areas and gloveboxes within the PFP. Therefore, it is assumed that the health effects from historical total plant emissions will be much greater than that resulting from just the sludge stabilization process, and this data will be used as a bounding case to evaluate the health effects for the proposed action.

The CAP88PC computer program from the U.S. Environmental Protection Agency (EPA) and the Hanford specific GENII computer program were used on the PFP annual radionuclide emissions from 1983 through 1991 to estimate radiation dose and LCFs to the offsite population within 80 kilometers (50 miles) of the PFP. The information is shown in Table 3. The LCF estimated health effect is the product of the dose and the factor 0.0005 LCF per person-rem, which comes from ICRP 60.[5]

[5] The International Commission on Radiological Protection (ICRP) has determined that the nominal cancer fatality coefficient for low dose, low dose rate whole body irradiation is approximately 0.0004 LCF/person-rem effective dose equivalent (EDE) for a worker population and approximately 0.0005 LCF/person-rem EDE for a population of all ages (ICRP 1991). Health effects (i.e., LCF) are computed by multiplying the radiological dose by the ICRP coefficient.

For comparison, an LCF of 1 would indicate that one cancer fatality would be expected to occur in the exposed population as a result of the radiation exposure.

It can be seen on Table 3 that the estimated LCFs to a member of the public due to one year of PFP operations is very low; i.e., an average LCF of 0.00005 for the approximate 400,000 population within 80 kilometers (50 miles) of the PFP. It is extremely unlikely that even one fatal cancer could have been induced by the operations at PFP over the past nine years. It is even less likely that a LCF would occur specifically as a result of the sludge stabilization operation. Appendix A provides the analysis of the historical plant emissions.

Table 3.
Annual Plutonium Finishing Plant Collective Dose and Health Effect.

Year	Person-rem	LCF
1991	0.0868	0.000043
1990	0.0604	0.00003
1989	0.0601	0.00003
1988	0.0343	0.000017
1987	0.0541	0.000027
1986	0.593	0.0003
1985	0.021	0.00001
1984	0.0208	0.00001
1983	0.0367	0.000018

5.1.2 Chemical Air Emissions

Operation of the stabilization process would also generate gaseous chemical emissions which would be discharged from the main ventilation stack. These emissions for a typical batch being stabilized would consist of about 9 grams (0.02 pounds) of butene from decomposition of organic materials and about 90 grams (0.2 pounds) of nitrogen oxides from decomposition of nitric acid and metal nitrates. The only other emissions would be less than 230 grams (0.5 pounds) each of carbon dioxide and water.

The onsite and offsite chemical concentrations for these batch emissions (except water) were modeled assuming a continuous operation averaging four batches per day. These concentrations are shown in Tables 4 and 5 below, along with comparison to any applicable Threshold Limit Values - both the Time Weighted Average (TLV-TWA) (NIOSH 1990) and the Short Term Exposure Limit (TLV-STEL) (ACGIH 1991), or Acceptable Source Impact Levels (ASILs) (WAC 173-460, 1991). TLV-TWA is a measure of the chemical concentration level to which a worker can safely be exposed 8 hours per day, 40 hours per week. The TLV-STEL measures the safe exposure level to a worker for a fifteen minute period. Both of these limits are applicable to onsite concentrations. The ASIL is a measure of safe exposure level to the public, and is therefore applicable to offsite concentrations. The predicted chemical concentration levels range from a factor of 100,000 to 1,000,000,000 below the applicable TLV-TWA, TLV-STEL or ASIL values.

Table 4.
Chemical Concentrations at the Maximum Onsite Receptor Locations Based on 99.5 Percent Meteorology and Comparison to TLV-TWA and TLV-STEL Limits.

Chemical	Concentration (8 hr) (mg/m^3)	TLV-TWA (mg/m^3)	Concentration (15 min) (mg/m^3)	TLV-STEL (mg/m^3)
NOx	0.0000062	5.6	0.000016	9.4
Butene	0.00000062	NA	0.0000016	NA
CO_2	0.000016	9000	0.00004	54000

Table 5.
Chemical Concentrations at the Maximum Offsite Receptor Locations Based on Annual Average Meteorology and Comparison to ASIL Values.

Chemical	Concentration (24 hr) (mg/m^3)	ASIL (mg/m^3)
NOx	0.0000005	0.1
Butene	0.00000005	NA
Carbon Dioxide	0.0000013	NA

5.2 Worker Radiation Exposure

The proposed action would result in a reduction of approximately 4 person-rem per year for all of the PFP operators, plus allow ventilation ductwork cleanout, which would result in an additional 6 person-rem reduction per year. However, the proposed action would result in radiation exposure to the workers when they perform operations involving close proximity to the sludges. It is estimated that the process will require three individuals per shift to spend one hour working in the proximity of the sludges (while at the gloveboxes, during transport of materials or during packaging). The composite whole body dose rate is expected to be about 10 millirem per hour. This process is planned to be operated on a three shift, seven day per week basis. At the expected processing rate of two batches per furnace per day, and assuming that 20 percent of the material must be recycled through the process, the cumulative dose would be 17 person-rem for the duration of the stabilization action. This would result in an estimated health effect of approximately 0.007 LCF for the directly exposed workers.

Workers are subject to routine radiation exposure from many of the operations within the plant. The radiation exposure resulting from the proposed action would be cumulative with exposures received from other operations. The radiation exposure of each operations worker is limited to no more than 2.0 rem per year, with administrative controls (HS-RCM, article 212) and a worker monitoring program which provide hold points starting at a cumulative exposure to any worker at 0.5 rem. There are adequate operations staff at PFP to perform the proposed action and other reasonably foreseen plant activities within this dose limit.

5.3 Solid Waste

The sludge stabilization process would generate a small amount of radioactive solid waste. This would result from disposal of the polyjars in which the sludges are currently stored. There would also be waste from the sealouts, sample analysis work, and other miscellaneous activities. Solid waste generation would be minimized in accordance with the current PFP waste minimization program. The volume of solid radioactive waste is estimated to be 0.01 cubic meter (0.5 cubic foot) per day at the expected processing rate. Approximately 4.3 cubic meters (150 cubic feet) of the waste would be stored or disposed at the Hanford Central Waste Complex.

5.4 Accident Potential

Two potential accidents were analyzed for operation of the sludge stabilization process: a major fire in the glovebox and a flammable gas deflagration. Both accidents have a probability of occurrence of 0.00001 or less. The estimated probability for either accident leading to a release of radioactive materials is the same, and the consequences from the flammable gas accident would be slightly higher; therefore, this was evaluated as the bounding accident. More details on the analysis of both accidents are provided in the letter analysis report (Ramble 1994).

5.4.1 Accident Scenario

Flammable gas (i.e., butene) would be generated during sludge stabilization operations due to the presence of tributyl phosphate in certain feedstocks. Tributyl phosphate decomposes slowly at temperatures just above 110 °C (230 °F) and the decomposition rate increases as the boiling point is approached (268 °C [514 °F]). The major gaseous products from the thermal decomposition of tributyl phosphate are butene and water.

An Operations Specifications Document for HC-21C would limit the tributyl phosphate content of feed materials to a maximum of 2 percent by weight. This equates to

10 grams (0.02 pounds) for a 500-gram (1.1 pound) charge. A cover gas, carbon dioxide or inert gas, would be fed to the furnace during the processing of charges containing organic material. The cover gas acts as a diluting gas to reduce the oxygen concentration such that the lower flammability limit (LFL) of butene is not reached in the furnace offgas. The LFL is defined as the minimum concentration of vapor in air at which propagation of a flame will occur on contact with a source of ignition.

For this analysis, it is assumed that 20 grams (0.04 pounds) of tributyl phosphate are present in the charge. This value is conservatively chosen to account for an error in charging the boat or an error in determining the concentration of tributyl phosphate present. It is further assumed that the cover gas is absent, that the furnace offgas is blocked, and that the controller fails in such a manner that all of butene potentially available is evolved instantaneously.

The amount of butene generated given 20 grams (0.04 pounds) of tributyl phosphate present in the charge is 12.6 grams (0.03 pounds). The butene generated is conservatively assumed to form a flammable mixture in the glovebox and ignite. The resultant deflagration is conservatively assumed to breach the glovebox releasing material into the surrounding room.

5.4.2 Probability

The annual probability of occurrence (i.e., frequency/year) of the postulated deflagration is estimated to be 0.00001 or less. This estimate is based in part on the human errors and equipment failures required for the event to occur as postulated. These include:

- an error in determining the concentration of tributyl phosphate resulting in twice the normal maximum quantity of tributyl phosphate being present
- inadequate cover gas flow to the furnace; this could result from human error or equipment failure (valve fails closed)
- inadequate furnace offgas flow; this could result from human error or equipment failure
- controller failure or programming error such that the furnace heats at its maximum rate
- controller failure (independent from that above) or programming error such that the high temperature deviation interlock does not remove power from the furnace

In addition, the assumption that a butene deflagration occurs is conservative. It is important to note that the assumption that a butene deflagration sufficient to breach the glovebox occurs is believed to be conservative. In a similar accident analysis performed for Glovebox MT-5 (located in the Plutonium Reclamation Facility of PFP), precise modelling of the butene generation rate and glovebox airflow patterns found that flammable concentrations are not physically possible (Shapley 1994).

5.4.3 Source Term

Using the worst-case assumption that butene would produce a deflagration equivalent to TNT, the ignition of 12.6 grams (0.03 pounds) of butene in the glovebox would disperse 126 grams (0.3 pounds) of plutonium. It is further assumed that the entire amount is plutonium of a respirable particle size. (Note that the weight percent of plutonium in plutonium oxide is 88 percent but this analysis assumes conservatively that the material is 100 percent plutonium.)

The 126 grams (0.3 pounds) of airborne plutonium is conservatively assumed to be expelled into room 230A. (Realistically, some of the airborne plutonium would be drawn into the glovebox ventilation system which provides an additional stage of filtration.) Room 230A is serviced by the E-3 ventilation system that provides one stage of HEPA filtration prior to discharge out the 291-Z stack. The resulting release to environment through the filtered ventilation from a butene deflagration in glovebox HC-21C would be 0.048 grams (0.0001 pounds) of plutonium.

Applying the approach used for the Glovebox MT-5 safety analysis, the ignition of 12.6 grams (0.03 pounds) of tributyl phosphate in HC-21C would disperse 35 grams of plutonium into room 230A, and hence an even lower release to the environment.

5.4.4 Accident Consequences

Based on the release of 0.048 grams (0.0001 pounds) of plutonium out the PFP stack, the maximally exposed onsite individual would receive an effective dose equivalent (EDE) of 0.015 rem and the maximally exposed individual at the site boundary would be exposed to an EDE of 0.0016 rem. The population exposure and related health effect are shown in Table 6. Based on the estimated LCFs it is very unlikely that there would be even one cancer fatality from exposure resulting from the postulated accident.

Table 6.
Health Effects from Accident Scenario.

	Sector	Exposed Population	Committed Effective Dose Equivalent	Health Effects
Worst Case Onsite Population	WNW	140	3.58 person-rem	0.0015 LCF
Worst Case Offsite Population	SE	114,734	21.5 person-rem	0.011 LCF

An estimate of the consequences to the two to three workers present in room 230A is based on several assumptions. The plutonium is expelled throughout the room immediately, and the workers inhale some of the plutonium before they exit the room. (In the event of airborne contamination, the workers are trained not to breathe before exiting the room.)

There would be no physical impact outside of the plant. The accident would likely result in equipment damage and physical injury to workers in the room and contamination spread to adjacent areas within the building, but the secure, reinforced room would limit physical impact.

5.5 Socioeconomic Impacts

Noise levels would be comparable to existing conditions at the PFP. The amount of equipment and materials to be used represent a minor long-term commitment of nonrenewable resources.

The proposed action is not expected to impact the climate, flora and fauna, air quality, geology, hydrology and/or water quality, land use, or the population. The cultural resources review supports these expectations.

Stabilizing these sludges would not require additional workforce. Therefore, no socioeconomic impact is anticipated.

5.6 Cumulative Impacts

Ongoing or planned activities occurring on the Hanford Site are numerous. The predominant activities that are either ongoing or planned within the foreseeable future involve environmental restoration and waste management activities. The proposed action is closely allied with other waste management activities. The Hanford Site maintains a site environmental monitoring program that routinely monitors radioactive air emissions.

5.6.1 Cumulative Impacts - Air (Radioactive)

In calendar year 1991, the release of plutonium-239/240 to the atmosphere from the 200 Areas was very small, approximately 0.00044 curies. The atmospheric emissions from plutonium-239/240 in 1995 are expected to be equal to or less than the emissions that were released in 1991.

Offgases resulting from the proposed action would contain small concentrations of suspended radionuclide particles, primarily plutonium oxide. As a result of the pollution control system (i.e., sintered metal filter, E-4 ventilation system, and double-stage HEPA filtration system), additional radionuclide emissions to the atmosphere, as a result of the proposed action would be extremely small.

Under normal operating conditions, radionuclide air emissions associated with the proposed action would fall below air permit requirements and would not be expected to result in any measurable increase in radiological emissions at the Hanford site. It is unlikely that even 1 LCF would occur as a result of the proposed action.

5.6.2 Cumulative Impacts - Solid Waste

The proposed action would generate approximately 0.01 cubic meters (0.5 cubic feet) of radioactive solid waste per day, which would be stored or disposed of in the Hanford Central Waste Complex. This waste would represent a very small incremental increase in the total amount of waste that is stored or disposed of on a daily basis at the Hanford site.

The storage and disposal of this waste would be in accordance with applicable regulations (see Section 6.2, Solid Wastes) that govern the storage and disposal of hazardous and radioactive waste at the Hanford site.

6.0 Permits and Regulatory Requirements

The Sludge Stabilization operation would be carried out in accordance with the DOE's environmental policy, which is "to conduct its operations in an environmentally safe and a sound manner...in compliance with the letter and spirit of applicable environmental statutes, regulations, and standards" (DOE Environmental Policy Statement DOE N 5400.2). The action would be consistent with all applicable laws, regulations, and compliance agreements, as outlined below.

6.1 Air Quality

Air emissions from the PFP would comply with the National Emissions Standards for Hazardous Air Pollutants permit administered by the U.S. Environmental Protection Agency, the Radioactive Airborne Emissions Program permit administered by the State of Washington Department of Health, and the nonradioactive air permit administered by the State of Washington Department of Ecology. In a meeting with Washington Department of Health personnel on June 12, 1994, it was determined that a Notice of Construction is not required for this action, as the action does not constitute a new activity at the PFP. A similar process has been operated in the past in another glovebox at the PFP.

6.2 Solid Wastes

The applicable regulation is WAC 173-303, "Washington Dangerous Waste Regulations." The EPA has delegated authority to the State of Washington, Department of Ecology, for dangerous-waste regulations which include the RCRA interim and final status permit program for hazardous wastes. The PFP is managed under RCRA Interim Status for dangerous waste treatment and storage at the 241-Z facility. The PFP also generates and manages containerized solid waste (non-regulated, dangerous waste, and radioactive mixed waste) in accordance with WAC-173-303 and RCRA requirements. These regulations would be applicable to any solid wastes generated from the stabilization process. Waste regulations are not directly applicable to the sludges or the stabilization process, as these sludges may not be declared as waste until the final disposition of special nuclear materials is determined.

6.3 Hanford Federal Facility Agreement and Consent Order

The applicable compliance agreement is the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement), EPA Docket Number 1089-03-04-120, Ecology Docket Number 89-54. The Tri-Party Agreement, signed by the EPA, DOE, and Washington State Department of Ecology, sets forth schedules and milestones for CERCLA and RCRA cleanup activities and compliance actions across the Hanford site. The PFP is committed to meeting all applicable Tri-Party Agreement milestones. Ongoing negotiations may add Tri-Party Agreement milestones for the cleanout of the PFP.

7.0 Agencies Consulted

Before the EA was written, several informal meetings were held with tribes and stakeholders, including règulatory agencies and public interest groups. These meeting were to inform the stakeholders of proposed PFP activities and receive informal responses. The meeting dates and participants are summarized in Appendix D.

Early drafts of this document were sent out to tribes and stakeholders in May 1994. One set of written comments was received from the Washington Department of Health, which were responded to at a routine monthly interface meeting with Washington Department of Health personnel on June 12, 1994. During the meeting, it was determined that a Notice of Construction is not required, as the action does not constitute a new activity at the PFP. A similar process has been operated in the past in another glovebox at the PFP.

A final draft of this document was sent to the Washington State Department of Ecology, the Yakama Indian Nation, Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, the Wanapum and other interested parties on September 12, 1994. Written comments were received from Ecology and Confederated Tribes of the Umatilla Indian Reservation. A meeting to clarify the comments was held between Ecology and RL on October 13, 1994. The comments and responses are found in Appendix E. No other written comments were received in response to the final draft document.

8.0 References

36 CFR 800, "Protection of Historic and Cultural Properties," *Code of Federal Regulations,* as amended.

40 CFR 1500-1508, 1978, "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," *Code of Federal Regulations,* as amended.

49 CFR 173.416 and 173.417, "Authorized Type B Packages," *Code of Federal Regulations,* as amended.

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Figures

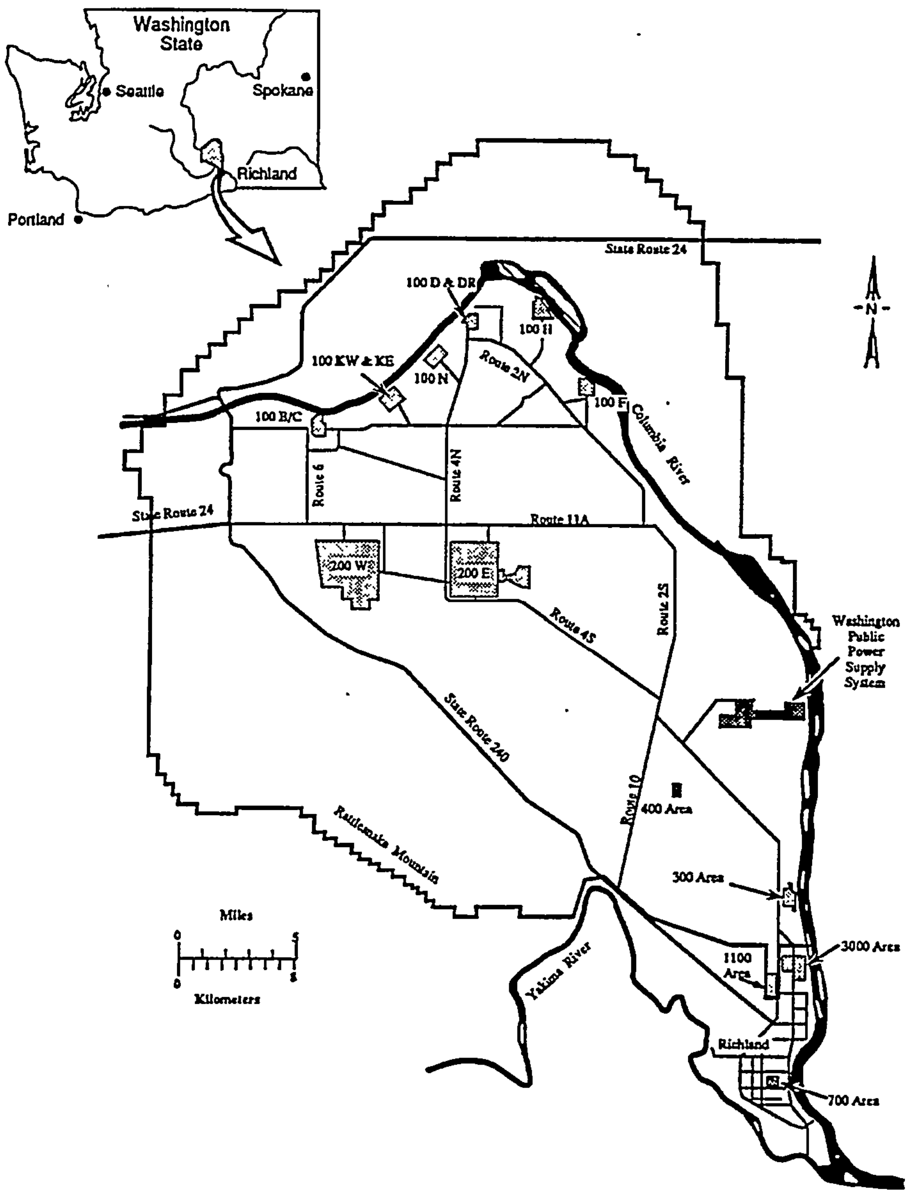

Figure 1. Hanford Site.

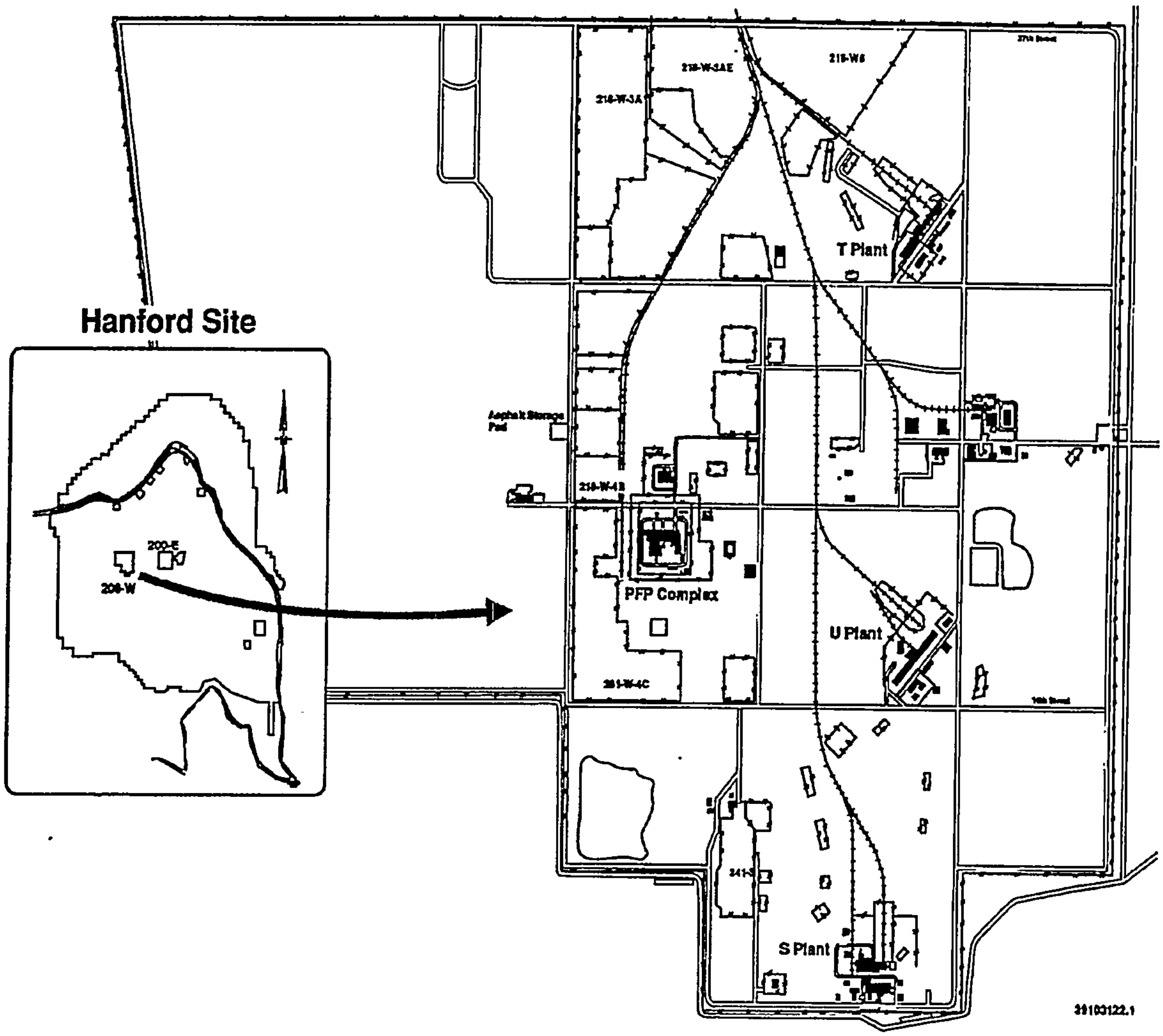

Figure 2. 200 West Area.
(This figure is not to scale.)

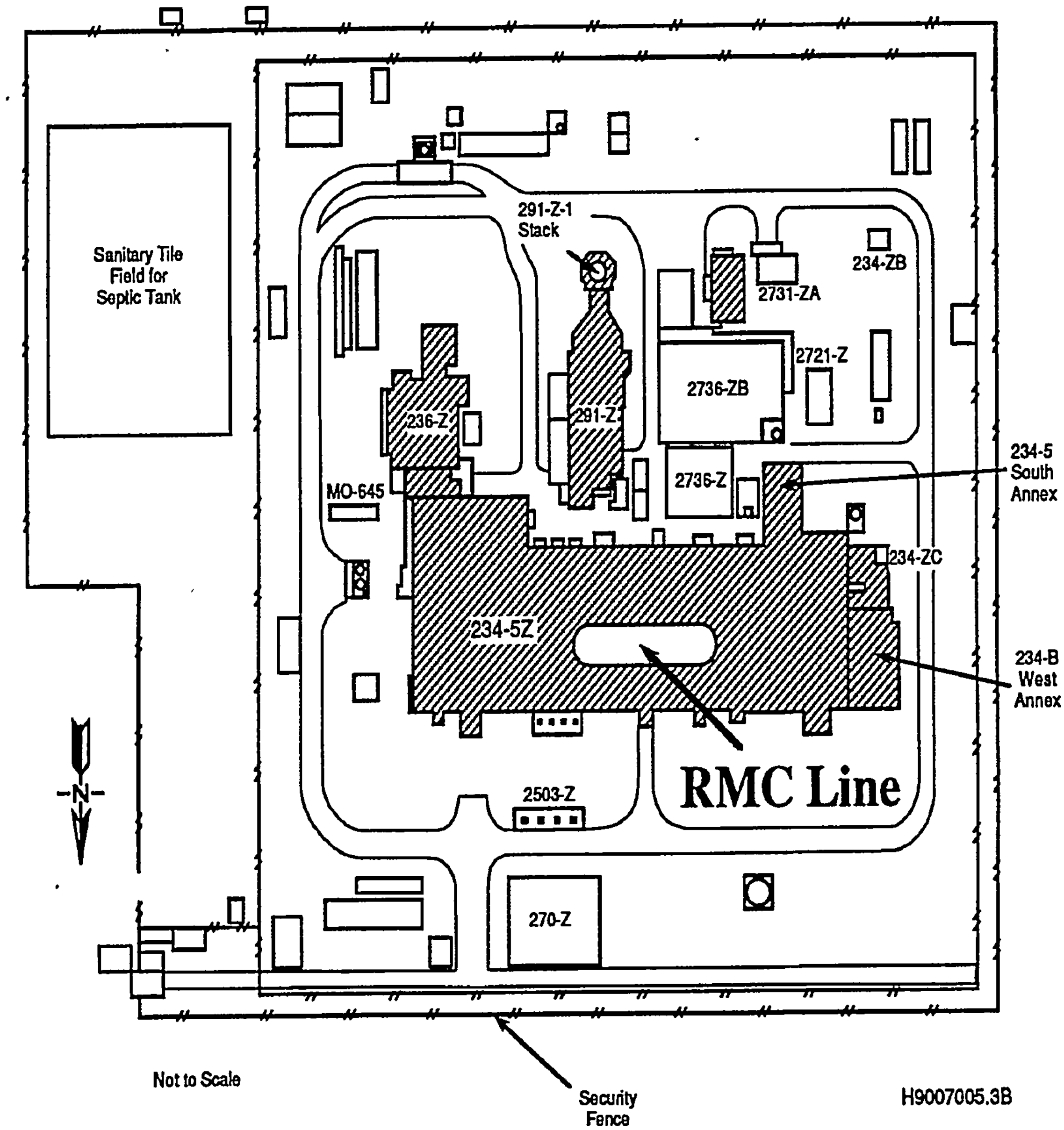

Figure 3. Remote Mechanical "C" Line Location within the Plutonium Finishing Plant Complex.

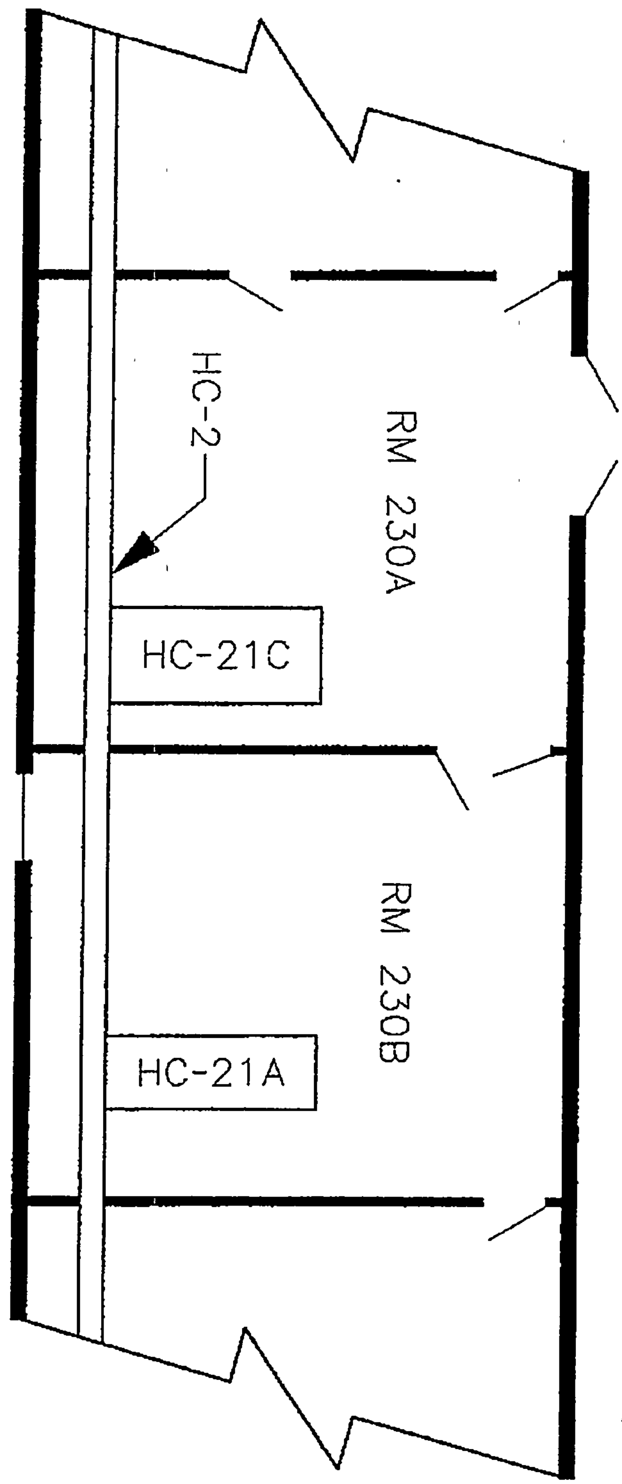

Figure 4. Plot Plan for Rooms 230A and 230B.

Appendix A

Historical Plutonium Finishing Plant Radionuclide Air Emissions Data

Historical Plutonium Finishing Plant Radioactive Air Emissions Data

The CAP88PC computer program from EPA was used on annual plutonium and americium emissions from the PFP to estimate radiation dose and fatal cancer risk to the offsite population within 50 miles of the PFP.

The measured emissions are shown in the table below. The total alpha emitting activity released each year is assumed to be 90 percent Pu-239 and 10 percent Am-241. These are averages. The actual percentage ranges from 5 to 15 percent. The Am-241 toxicity and movement in the environment are similar to that of plutonium.

Annual Plutonium Finishing Plant Alpha Emissions.

Year	Stack Conc	Total Flow	Curies per Year	
	μCi/ml	L/Year	Pu-239	Am-241
1991	1.50×10^{-13}	3.9×10^{12}	5.27×10^{-4}	5.85×10^{-5}
1990	1.10×10^{-13}	3.7×10^{12}	3.66×10^{-4}	4.07×10^{-5}
1989	1.17×10^{-15}	3.46×10^{12}	3.64×10^{-4}	4.05×10^{-5}
1988	6.24×10^{-14}	3.7×10^{12}	2.08×10^{-4}	2.31×10^{-5}
1987	9.85×10^{-14}	3.7×10^{12}	3.28×10^{-4}	3.64×10^{-5}
1986	1.08×10^{-12}	3.7×10^{12}	3.60×10^{-3}	4.00×10^{-4}
1985	3.82×10^{-14}	3.7×10^{12}	1.27×10^{-4}	1.41×10^{-5}
1984	3.79×10^{-14}	3.7×10^{12}	1.26×10^{-4}	1.40×10^{-5}
1983	6.69×10^{-14}	3.7×10^{12}	2.23×10^{-4}	2.48×10^{-5}

The CAP-88 computer program was fed Hanford Site wind data collected in the 200 Areas from 1983 to 1991. The population distribution is for people offsite, and is documented in Beck, D. M., B. A. Napier, M. J. Scott, A. G. Thurman, M. D. Davis, D. B. Pittenger, S. F. Shindle, and N. C. Batishko. 1991. *Hanford Area 1990 Population and 50-year Projections*, PNL-7803, Pacific Northwest Laboratory, Richland, Washington. The population table used was compiled from the 1990 census. The standard CAP88PC consumption and transfer parameters were used. The projected population dose for a unit release (1 curie per year) is shown below.

Note that some of the default parameters are sometimes modified to make the food consumption the same as what is used in the GENII code. However, many parameters, such as the concentration ratios, cannot be changed. Since the dose from plutonium and americium is dominated by the inhalation pathway, rather than ingestion, the CAP88PC defaults were used. The improvements resulting from modification of some of the default parameters increase the final doses by less than 5 percent, a meaningless change.

The table below shows the population doses computed by CAP88PC and GENII with one curie being released during a year. The two codes differ by only 10 percent because the ingestion dose is a minor contributor. Both codes were given the soluble forms of plutonium to use for both inhalation and ingestion.

Population Dose Factors, Person-rem/Ci.

	Pu-239	AM-241
CAP88PC	148	152
GENII	160	170

The annual population doses are the product of the dose factors and the activity released each year. These doses are listed in the table below. In addition, the estimated lifetime fatal cancer risk is shown. This health effect is the product of the dose and the factor 5.0×10^{-4} latent cancer fatalities per person-rem, which comes from ICRP 60.

Annual PFP Collective Dose and Health Effect.
(exposed population is 375,860 people)

Year	Person-rem	Risk
1991	8.68×10^{-2}	4.3×10^{-5}
1990	6.04×10^{-2}	3.0×10^{-5}
1989	6.01×10^{-2}	3.0×10^{-5}
1988	3.43×10^{-2}	1.7×10^{-5}
1987	5.41×10^{-2}	2.7×10^{-5}
1986	5.93×10^{-1}	3.0×10^{-4}
1985	2.10×10^{-2}	1.0×10^{-5}
1984	2.08×10^{-2}	1.0×10^{-5}
1983	3.67×10^{-2}	1.8×10^{-5}

It can be seen on the above table that the potential risk to a member of the public from PFP operations is very low. It is extremely unlikely that even one fatal cancer in a population of 375,860 could be induced by the operations at PFP over the past nine years.

GENII Dose Calculation Program, Version 1.485 3-Dec-90, (Napier 1988)

CAP 88 - PC Version 1.00 Clean Air Act Assessment Package - 1988 (EPA 1992)

Appendix B

Chemical Air Emissions Data

Chemical Air Emissions Data

This appendix details the methodology used to estimate the onsite and offsite chemical concentrations due to emissions from PFP during sludge stabilization operations. The estimated quantities of chemicals released during processing are shown in Table 1 below. Table 1 also includes estimated routine release rates based on processing 4 batches of sludge per day. This release rate assumes 4 batches of sludge are processed continuously over a 24-hour period. Each batch weighs approximately 1 pound.

Table 1.
Chemical Releases from the Plutonium Finishing Plant During Sludge Stabilization.

Chemical	Quantity (lb)[a]	Estimated Release Rate (mg/s)[b]
NO_x	0.2	4.20
Butene	less than 0.02	0.42
Carbon Dioxide	less than 0.5	10.5
Water	less than 0.5	10.5

[a] Quantity released due to processing one pound of sludges.

[b] Release rate due to processing four batches over a 24-hour period.

Emissions Assumptions

Estimates of gaseous emissions from operation of HC-21C were calculated based on composition data supplied by Plutonium Finishing Plant Process Control. Materials to be treated include sludges from the last Plutonium Recovery Facility (PRF) campaign, sludges from the PRF training run, and miscellaneous floor sweeps from remote mechanical line C (RMC). Assumptions used for the calculations were: one polyjar processed per batch, polyjar will be no more than half full, any carbon tetrachloride initially present has evaporated, the furnace will be operated in an atmosphere that supplies sufficient oxygen for complete oxidation, and all sludges will be less than 2 percent organic. The maximum amount present has been used for each component.

The density of the sludges is assumed to be 2 g/cc. This is based on the observation that when the analytical laboratory contacts the sludges with carbon tetrachloride (density approximately 1.5 g/cc), the sludges remains at the bottom of the container. The polyjars have a volume of 500 cc. If the polyjars are no more than half full of sludges, the maximum amount of sludge treated at one time will be 500 g. This is rounded to one pound.

Gases that are expected to be generated in this process include nitrogen oxides from nitric acid and metal nitrates, butene from butyl phosphates, carbon dioxide from organic compounds and carbonates, and water vapor. As a semi-quantitative analysis of the materials, consider: If the sludges are less than 2 percent organic and we have one pound of sludges, stabilizing the sludges in HC-21C will generate less than 0.02 pounds of butene. The maximum nitric acid was 50 percent 3-5 molar HNO3. Nitrates are also present as up to 50 percent Fe(NO3)3 and up to 39 percent Pu(NO3)4. Because of the uncertainty in these estimates, if a conservative estimate of 50 percent concentrated nitric acid is assumed, then 0.2 pounds of nitrogen oxides will be generated per polyjar. The only other gases expected are carbon dioxide and water. Both of these are expected to be less than 0.5 pounds.

Release Scenario Description

The chemicals released (Table 1) are assumed to enter the PFP ventilation system. The ventilation system exhausts to the atmosphere through the 200 ft (61 m) PFP stack. The stack flow rate is 260,000 scfm (123 m^3/s) and the stack inside diameter is 13.5 ft (4.1 m) (Hey 1994). The release is modeled as a stack release, and momentum rise will be accounted for using the momentum rise model (Hey 1993).

Two types of dispersion calculations were made. The first modeled the release as a chronic release using 99.5 percent meteorology. For onsite receptors, credit was taken for plume meander based on an 8 hour release using the fifth power law model (Hey 1993). The resulting onsite concentrations were compared to the TLV-TWA values (ACGIH 1991), which are based on an 8 hour averaging time. For offsite receptors, credit was taken for plume meander based on a 24 hour release. The offsite concentrations was compared to the Acceptable Source Impact Levels (ASILs) from WAC 173-460, which apply at the site boundary, and are based on a 24 hour averaging time.

The second dispersion calculation modeled the release as a short term release using 99.5 percent meteorology. The same release rate (Table 1) was used, however, the release duration was 15 minutes and no credit was taken for plume meander. The resulting onsite concentrations were compared to the Short-Term Exposure Limits (TLV-STEL) from ACGIH (1991), which are based on a 15 minute averaging time. Note that there are no short-term concentration limits applicable to the public at the site boundary.

Results of Dispersion Calculations

The GXQ code Version 3.1 C, General Purpose Atmospheric Dispersion Code, (Hey 1993) was used to calculate the onsite and offsite X/Q values based on the specified assumptions. Calculations were made for receptors at the nearest onsite facilities and for receptors at the site boundary. The distances to the onsite and offsite receptors are shown in Tables 2 and 3 below (WHC 1994) along with the resulting X/Q values.

Table 2.
Distances to Nearest Onsite Facilities and X/Q Values for a Stack Release from the Plutonium Finishing Plant.

Nearest Onsite Facility	Distance from Stack (m)	X/Q (s/m^3)	
		15 min.	8 hr.
272-WA (WNW)	630	3.85×10^{-6}a	1.48×10^{-6}a
T-Plant (NE)	1580	1.44×10^{-6}	5.49×10^{-7}
2713-W (ENE)	830	2.14×10^{-6}	8.19×10^{-7}
U-Plant (ESE)	1060	2.51×10^{-6}	9.60×10^{-7}
242-S (SSE)	930	3.10×10^{-6}	1.19×10^{-6}

[a] Maximum onsite X/Q based on 99.5 percent meteorology.

Table 3.
Distances to the Site Boundary and Maximum X/Q Values for a Stack Release from the Plutonium Finishing Plant.

Transport Direction	Distance (km)	X/Q (24 hr) (s/m^3)	Transport Direction	Distance (km)	X/Q (24 hr) (s/m^3)
S	15.0	1.0×10^{-7}	N	19.2	7.80×10^{-8}
SSW	15.4	9.74×10^{-8}	NNE	26.0	4.35×10^{-8}
SW	16.1	9.24×10^{-8}	NE	28.9	4.74×10^{-8}
WSW	13.2	1.02×10^{-7}	ENE	25.6	5.83×10^{-8}
W	12.5	1.19×10^{-7}a	E	25.2	6.17×10^{-8}
WNW	13.2	1.13×10^{-7}	ESE	30.0	5.22×10^{-8}
NW	16.5	9.09×10^{-8}	SE	25.2	6.15×10^{-8}
NNW	17.4	8.63×10^{-8}	SSE	22.9	6.51×10^{-8}

[a] Maximum offsite X/Q based on 99.5 percent meteorology.

The 99.5 percent X/Q takes into account the directional aspects of site meteorology, whereas the 95 percent X/Q does not. The 99.5 percent X/Q is that dispersion coefficient which is exceeded less than 0.5 percent of the time (44 hours a year) in any given 22.5 degree compass sector. The 95 percent X/Q treats each sector the same. The 95 percent X/Q is that dispersion coefficient which is exceeded less than 5 percent of the time in any given sector, regardless of how often the wind blows in that direction.

The annual average X/Q is used to evaluate normal operational releases which occur continuously throughout the year. This X/Q cal be used to determine the risk of a facility or operation which includes accidents that do not necessarily occur during worst-case meteorology.

The maximum X/Q for the onsite receptor for a chronic (8 hour) release using 99.5 percent meteorology is 1.48E-6 s/m^3 (630 m WNW). The maximum X/Q for the offsite receptor for a 24 hour release is 1.19×10^{-7} s/m^3 (12.5 km W).

The maximum X/Q for the onsite receptor for a short term (15 minute) release using 99.5 percent meteorology is 3.85×10^{-6} s/m^3 (630 m WNW)

Tables 4 and 5 contain estimates of the onsite and offsite chemical concentrations based on annual average meteorology. Also included are the appropriate concentration limits for comparison. Since water vapor is not a health hazard, it is not included in the tables. The maximum onsite concentration based on an 8 hour release is a factor of 1.0×10^9 below the TLV-TWA limit for CO_2, the NO_x concentration is a factor of 1.0×10^6 below the limit, and there are no limits given for butene. The maximum onsite concentration based on a short term (15 min) release is a factor of 1.0×10^9 below the TLV-TWA limit for CO_2 and the NO_x concentration is a factor of 1.0×10^6 below the limit. The maximum offsite concentration for NO_x is a factor of 1.0×10^6 below the ASIL limit, and there are no limits given for butene and CO_2. It is therefore concluded that the health impact due to routine chemical emissions from PFP during sludge stabilization is negligible.

Table 4.
Chemical Concentrations at the Maximum Onsite Receptor Locations Based on 99.5 Percent Meteorology and TLV-TWA/STEL Limits.

Chemical	Concentration (8 hr) (mg/m^3)[a]	TLV-TWA (mg/m^3)	Concentration (15 min) (mg/m^3)[a]	TLV-STEL (mg/m^3)
NOx	6.2×10^{-6}	5.6[b]	1.6×10^{-5}	9.4[b]
Butene	6.2×10^{-7}	NA	1.6×10^{-6}	NA
CO_2	1.6×10^{-5}	9000	4.0×10^{-5}	54000

[a] Product of maximum onsite X/Q (Table 2) and the release rate (Table 1).

[b] NOx limit taken to be NO_2.

Table 5.
Chemical Concentrations at the Maximum Offsite Receptor Locations Based on Annual Average Meteorology and ASIL Values.

Chemical	Concentration (24 hr) (mg/m^3)[a]	ASIL[b] (mg/m^3)
NOx	5.0×10^{-7}	0.1
Butene	5.0×10^{-8}	NA
Carbon Dioxide	1.3×10^{-6}	NA

[a] Product of maximum offsite X/Q (Table 3) and the release rate (Table 1).

[b] Acceptable Source Impact Level from WAC 173-460 (WAC 1991).

Appendix C

Cultural Resources Review

Battelle
Pacific Northwest Laboratories
Battelle Boulevard
P.O. Box 999
Richland, Washington 99352
Telephone (509) 372-1791

February 3, 1993

Ms. Mardine Campbell
Westinghouse Hanford Company
Operations Support Services
P. O. Box 1970/T5-54
Richland, WA 99352

Dear Mardine:

INSTALLATION OF MUFFLE FURNACES IN A GLOVEBOX IN PFP

In response to your request for a cultural resources review received February 2, 1994, staff at the Hanford Cultural Resources Laboratory (HCRL) finds that the Installation of Muffle Furnaces in a Glovebox in PFP project does not require a cultural resources review. The HCRL staff requires a review of all projects that are considered to be federal undertakings, as defined in 36 CFR Part 800. According to the information that you supplied, PFP plans to install two muffle furnaces (small) in glovebox HC-21C to stabilize plutonium bearing sludges. Since no structural modifications will occur, the project is not considered to be a federal undertaking.

Thank you for contacting the HCRL. Please call me at 372-1791 if you have any questions.

Very truly yours,

M. E. Crist
M. E. Crist
Technical Specialist
Cultural Resources Project

Concurrence: M. K. Wright
M. K. Wright, Scientist
Cultural Resources Project

cc: LB

Appendix D

Tribal and Stakeholder Involvement

Tribal and Stakeholder Involvement

The U.S. Department of Energy and the Westinghouse Hanford Company successfully implemented a tribal and public involvement process setting a new course for PFP activities, which include tribal and public values. In November 1993, DOE and WHC initiated small group meetings to discuss PFP activities. Meetings were held with representatives of those groups expressing a keen interest in plans for stabilizing the facility. At each meeting they discussed the particular concerns raised by the groups and possible options for dealing with the materials that pose worker and public safety. As the meetings occurred over a five-month period, the discussions also reflected ongoing correspondence between RL and HQ. A new course was set which includes an Environmental Impact Statement for the PFP with interim actions to resolve safety concerns. A "wrap-up" meeting was held with representatives of interested groups in March 1994. The milestone was completed March 16, 1994.

Small, informal meetings occurred with these groups. As these meetings were informal, transcripts were not kept.

Date	Group	Names	Location
11/12/93	Hanford Education Action League	Lynne Stembridge, Todd Martin	Spokane
12/3/93	Seattle Area Groups	Gerald Pollet (Heart of America Northwest), Tom Carpenter (Government Accountability Project)	Seattle
12/30/93	Portland Area Groups	Paige Knight, Bill Collins (Hanford Watch), Dirk Dunning (Oregon Department of Energy), Bill Bires (NW Veterans for Peace), Robin Klein (Hanford Action of Oregon), and Dr. Richard Belsey (Oregon Physicians for Social Responsibility)	Portland
2/3/94	State of Washington Department of Health	Al Conklin	
2/18/94	State of Washington Department of Ecology	Roger Stanley, Tom Tebb	
3/9/94	"Wrap-up" Workshop	Betty Tabbutt, Josh Baldi (Washington Environmental Council), Lynne Stembridge, Todd Martin (Hanford Education Action League), Gerald Pollet, Cynthia Sarthou (Heart of America Northwest), Greg DeBruler (Columbia River United), Tom Carpenter (Government Accountability Project), and Paige Knight (Hanford Watch)	Seattle
3/15/94	Confederated Tribes of the Umatilla Indian Reservation	Michael Farrow, J.R. Wilkinson, Tom Gilmore, Alan Childs, Les Spino, Chris Burford	Mission, Oregon
3/16/94	U.S. Environmental Protection Agency	Doug Sherwood	Teleconference
5/4/94	Seattle Area Groups	Tom Tebb, Paula Smith, Cindy Grant, John Blacklaw, Dirk Dunning, Cynthia Sarthou, Todd Martin, Paige Knight, Betty Tabbutt, Sue Gould	Seattle

Appendix E

Pre-Approval Review

Comments from State of Washington, Department of Ecology

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

P.O. Box 47600 • Olympia, Washington 98504-7600
(206) 407-6000 • TDD Only (Hearing Impaired) (206) 407-6006

October 7, 1994

Mr. Paul F. X. Dunigan, Jr.
U.S. Dept. of Energy
Richland Operations Office
PO Box 550
Richland WA 99352

Dear Mr. Dunigan:

On behalf of the Department of Ecology, we would like to thank you for the opportunity to comment on the environmental assessment (EA) for the Sludge Stabilization at the Plutonium Finishing Plant (94-TPA-147). We reviewed the EA and have the following comments.

General Assumptions Regarding the EA Approach

The EA for sludge stabilization does not clearly link with other Environmental Impact Statements (EISs), either planned or now underway, such that the public can see cumulative impacts and relationships among approaches to fissile materials, wastes, Hanford cleanup, transition and decommissioning of old facilities.

The EA describes sludge stabilization as an interim action to proceed other stabilization actions at the Plutonium Finishing Plant (PFP) that will be covered in a future EIS. The rationale for excluding this interim action from this EIS lacks significant detail in the text or graphical aids (e.g., charts or graphs on personnel exposure, costs, etc.) to convince the reader.

Ecology is concerned that this material more closely resembles waste or exhibits waste-like characteristics, such that it should be managed as waste accordingly. The proposed alternative does not fully discuss implications or relationships of storage and disposition of weapons-usable fissile material. The EA should more thoroughly explore the possible classification of this material as waste and/or altering this material (spiking, cementing, etc.) such that it is in a form not readily usable for nuclear weapons.

Mr. Paul F. X. Dunigan
October 7, 1994
Page 2

It is the Governor's personal view that, "We have no greater obligation in this century than to ensure that surplus plutonium is never again used in nuclear arms -- in this nation, in the former Soviet Union, or in nations like North Korea that covet atomic bombs."[1]

Does this material (50 lbs. of impure plutonium oxide) add additional inventory to the weapons-useable stockpile, such that it violates international treaties on nuclear arms reduction? similarly, does this material oppose the Clinton Administration's non-proliferation initiative? To justify the preferred alternative, the EA needs additional discussion of these issues in context of the Weapons-Usable Fissile Material EIS that is currently undergoing a public scoping process.

Ecology commends USDOE for providing a briefing on the stabilization of the sludge material at PFP. Ecology recognizes the efforts being made regarding public participation on sensitive materials such as plutonium and/or special nuclear materials. However, one briefing to various stakeholders, tribal nations, and regulators (USDOE briefed Ecology on February 18, 1994) that focused primarily on the process of sludge drying and not on alternatives that include disposal options, lacks the credibility necessary for public and regulatory involvement to be successful.

We would recommend a workshop or working session that breaks down individual agendas, and puts people of diverse perspectives together as teams. The teams would focus on the viable solutions or alternatives that represent the values and perspectives of all parties. We believe that such an approach, or something similar, supports the intent of the Secretarial policy for public participation that provides respect for different perspectives, and a genuine quest for a diversity of information and ideas.

Safety and Environmental Concerns and Assumptions

Section 2.2 Process Description

This section describes how the process of drying the sludge will occur and where. From reading this section, apparently 400 to 600 batches would need to be processed, though the estimated number of containers containing less than 2 percent organic

1 Comments of Governor Mike Lowry on the Storage and Disposition of Weapons-Usable Fissile Materials, Delivered by Don Wolgamott, Deputy Staff Director, August 31, 1994.

Mr. Paul F. X. Dunigan
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composition is not given. This appears to be a lot of handling. How have plant personnel been trained to accomplish this without incident? Please describe in more detail.

Section 5.4.1 Accident Scenario

This section discusses the potential accident scenario related to flammable gas (i.e., butane) deflagration. Additional discussion is needed on operational readiness review related to having the equipment perform as it would if operational. The results of such reviews would lend credibility to the probability percentage (0.00001) of an accident occurring.

The EA indicates that butene in the furnace offgas will not reach its lower flammability limit (LFL). As most offgas systems are designed to use below the 25 percent of the LFL, allowing a level below, but <u>near</u>, the LFL may not be adequate.

Permits and Regulatory Requirements

Ecology also notes that A Notice of Construction air permit is required for the two new muffle furnaces and was not clearly addressed (page 6-1).

Alternative Options

The disposal alternative has not been thoroughly explored or explained in sufficient detail to exclude it as a viable alternative. The worker radiation exposure is less than the proposed alternative, and has the attractiveness of dispositioning the plutonium in form from which the plutonium would be difficult to recover.

The EA should provide more detail about why 250 drums would occupy 60 percent of the capacity of the Central Waste Complex. Is the capacity problem related to curie content or volume of drums?

The 250 drums would use only 12.5 percent of the Transuranic Waste Storage and Assay Facility's capacity. Which USDOE directives do not allow this amount and classification of special nuclear material to be stored at TRUSAF? Please provide a reference or citation documenting this statement.

We recommend that a working group be established with a strategy for reviews to more clearly reflect the concerns of the State of Washington on this important issue.

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If you have any questions, please call Mr. Ron Effland with our Nuclear Waste Program at (206) 407-7134.

Sincerely,

Keith E. Phillips

Keith E. Phillips, Supervisor
Environmental Review and
Sediment Section

KEP:vs
94-7376

cc: Ron Effland, NM
Bob King, NM
G. Thomas Tebb, Kennewick

Department of Energy Response to Comments from State of Washington, Department of Ecology

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

95-TPA-016 OCT 1 9 1994

Mr. Keith E. Phillips, Supervisor,
Environmental Review and Sediment Section
State of Washington
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Dear Mr. Phillips:

RESPONSE TO STATE OF WASHINGTON DEPARTMENT OF ECOLOGY COMMENTS ON THE ENVIRONMENTAL ASSESSMENT FOR PLUTONIUM FINISHING PLANT SLUDGE STABILIZATION

Thank you for your comments on the Environmental Assessment for Sludge Stabilization at the Plutonium Finishing Plant.

Mr. O. A. Farabee, acting director of the U.S. Department of Energy, Richland Operations Office, Transition Program Division, met with Mr. G. T. Tebb of the State of Washington Department of Ecology, Nuclear Waste Program, and Mr. D. J. McBride of the Westinghouse Hanford Company Plutonium Finishing Plant on October 13, 1994, to discuss the comments. The enclosed responses to your comments reflect the discussion. Please refer any questions to me on (509) 376-6667, or Mr. B. F. Burton on (509) 373-3341.

Sincerely,

Paul F. X. Dunigan, Jr.

Paul F. X. Dunigan, Jr.
NEPA Compliance Officer

Enclosure

cc w/encl:
R. Effland, Ecology
G. Tebb, Ecology
G. Tallent, Ecology

RESPONSE TO COMMENTS ON THE ENVIRONMENTAL ASSESSMENT FOR PLUTONIUM FINISHING PLANT SLUDGE STABILIZATION

1. *The EA for sludge stabilization does not clearly link with other Environmental Impact Statements (EISs), either planned or now underway, such that the public can see cumulative impacts and relationships among approaches to fissile materials, wastes, Hanford cleanup, transition and decommissioning of old facilities.*

Response: The proposed action does not affect or prejudice decisions being considered in other Environmental Assessments (EAs) or Environmental Impact Statements (EISs) currently in preparation. The material being stabilized is simply being placed in a safer configuration pending a policy decision on the ultimate disposition of the material.

There are, however, several ongoing National Environmental Policy Act (NEPA) reviews which will affect activities at the Plutonium Finishing Plant (PFP) and the ultimate disposition of the plutonium stored at the PFP (including the sludge items). The most relevant documents and their anticipated impacts include:

<u>Programmatic Environmental Impact Statement for Storage and Disposition of Weapons-Usable Fissile Materials (PEIS)</u> -- This NEPA review, which was initiated after the preparation of the Sludge Stabilization EA and therefore is not included as a reference, will determine the ultimate disposition of plutonium and other special nuclear materials currently stored throughout the DOE Complex. It will therefore affect activities at the PFP and the final disposition of the sludge items discussed in the EA. Until the PEIS is complete, it is important to avoid taking actions which may prejudice or contradict the decisions under evaluation.

<u>Plutonium Finishing Plant Cleanout Environmental Impact Statement (PFP EIS)</u> -- The Sludge Stabilization EA describes an interim action to precede the PFP EIS. The PFP EIS will evaluate impacts and alternatives for stabilization of plutonium-bearing materials within the PFP; cumulative impacts from completed interim actions will also be included.

<u>Environmental Assessment: Shutdown of the Fast Flux Test Facility, Hanford Site, Washington</u> -The EA for shutdown of the FFTF describes the steps necessary for transition and shutdown of the FFTF to a state ready for decommissioning. One activity included in the EA is the transfer of unirradiated fuel from the FFTF to the PFP for storage. While this activity affects the PFP, it does not affect the storage locations used for sludge items either before or after they are stabilized.

2. *The EA describes sludge stabilization as an interim action to proceed [sic] other stabilization actions at the Plutonium Finishing Plant (PFP) that will be covered in a future EIS. The rationale for excluding this interim action from this EIS lacks significant detail in the text or graphical aids (e.g., charts or graphs on personnel exposure, costs, etc.) to convince the reader.*

Response: Section 1.0 of the EA includes a description of the worker safety justification for promptly stabilizing chemically reactive plutonium-bearing materials currently stored in gloveboxes within the Plutonium Finishing Plant. Section 5.2 elaborates on the expected dose reduction from the action; a projected reduction of 4 rem per year is expected after completion of the stabilization activity.

3. *Ecology is concerned that this material more closely resembles waste or exhibits waste-like characteristics, such that it should be managed as a waste accordingly. The proposed alternative does not fully discuss implications or relationships of storage and disposition of weapons-usable fissile material. The EA should more thoroughly explore the possible classification of this material as waste and/or altering this material (spiking, cementing, etc.) such that it is in a form not readily usable for nuclear weapons.*

Response: It is the policy of the Department of Energy that plutonium and other fissile materials currently in storage within the Plutonium Finishing Plant should be considered to be special nuclear material rather than waste until such time as a national policy decision on the ultimate disposition of the material can be reached.

As discussed in the response to comment #1, the Programmatic Environmental Impact Statement for Storage and Disposition of Weapons-Usable Fissile Materials will address the ultimate disposition of the plutonium in storage. Until a disposition decision is reached, it is premature to attempt to further adulterate or alter the material in a manner which may be incompatible with its ultimate disposition. The stabilization activity proposed in the EA is intended to make the materials safe for intermediate storage pending a disposition decision, without purifying the materials or making them more readily usable in weapons.

4. *It is the Governor's personal view that, "We have no greater obligation in this century than to ensure that surplus plutonium is never again used in nuclear arms -- in this nation, in the former Soviet Union, or in nations like North Korea that covet atomic bombs."*

Response:

The Department of Energy believes that the sludge stabilization activity is consistent with the Governor's viewpoint.

5. *Does this material (50 lbs. of impure plutonium oxide) add additional inventory to the weapons-usable stockpile, such that it violates international treaties on nuclear arms reduction?*

Response: The reactive sludge items described in the EA are already in existence and are identified in plutonium inventories as residue materials.

The reactive sludge items contain impurities which would prevent their use directly in weapons production without further processing. In addition to the impurities, the sludge items contain moisture and trace organics which cause the materials to generate gases and prevent their placement in sealed storage in vaults. The sludge stabilization activity described in the EA would drive off the moisture and trace organic components to enable safe storage, but would not purify the materials or make them more suitable for weapons production.

It should be noted that although the materials are not considered suitable for weapons use without further processing, they do fit the definition of weapons-usable fissile materials in the context of the Programmatic Environmental Impact Statement for Storage and Disposition of Weapons-Usable Fissile Materials, and may therefore be included in the decision on the ultimate disposition of these materials.

5a. *Similarly, does this material oppose the Clinton Administration's non-proliferation initiative? To justify the preferred alternative, the EA needs additional discussion of these issues in context of the Weapons-Usable Fissile Material EIS that is currently undergoing a public scoping process.*

Response: Please see the response to item #5 above. The proposed action under the EA will not lead to the export of special nuclear materials or technology, and is therefore consistent with the Administration's policy.

6. *Ecology commends USDOE for providing a briefing on the stabilization of the sludge material at PFP. Ecology recognizes the efforts being made regarding public participation on sensitive materials such as plutonium and/or special nuclear materials. However, one briefing to various stakeholders, tribal nations, and regulators (USDOE briefed Ecology on February 18, 1994) that focused primarily on the process of sludge drying and not on the alternatives that included disposal options, lacks the credibility necessary for public and regulatory involvement to be successful.*

Response: A series of briefings and workshops were conducted with stakeholder, tribal, and regulatory agencies starting in November, 1993, and continuing through the present. These briefings have addressed comments and suggestions from several parties regarding sludge stabilization vs. disposal options, and serious consideration has been given to disposal alternatives. (See response to item #12.)

As part of the public participation efforts related to the sludge stabilization activity, a preliminary draft of the EA was made available to the State, Tribes, and stakeholder groups in May, 1994. On May 4, 1994, in a stakeholder briefing, copies were hand-delivered to representatives of the Washington Department of Ecology (G. T. Tebb and Paula Smith), Washington Department of Health (Cindy Grant and John Blacklaw), Oregon Department of Energy (Dirk Dunning), Heart of America Northwest (Cynthia Sarthou), Hanford Education Action League (Todd Martin), Hanford Watch (Paige Knight), Washington Environmental Council (Betty Tabbutt), and the Hanford Advisory Board (Sue Gould). Additional copies were mailed during the following week to tribal representatives and to interested parties who did not attend the briefing.

The only written comments received on the preliminary draft EA were from the Washington Department of Health. Oral comments were received from several interested parties and were incorporated into the EA also. The Washington Department of Ecology did not make any comment at that time.

7. *We would recommend a workshop or working session that breaks down individual agendas, and puts people of diverse perspectives together as teams. The teams would focus on the viable solutions or alternatives that represent the values and perspectives of all parties. We believe that such an approach, or something similar, supports the intent of the Secretarial policy for public participation that provides respect for different perspectives, and a genuine quest for a diversity of information and ideas.*

Response: As discussed in item #6 above, the public involvement workshops held to date have led to extensive opportunities to share viewpoints and suggestions for viable alternatives.

Safety and Environmental Concerns and Assumptions

8. *(Section 2.2 Process Description) -- This section describes how the process of drying the sludge will occur and where. From reading this section, apparently 400 to 600 batches would need to be processed, though the estimated number of containers containing less than 2 percent organic composition is not given. This appears to be a lot of handling. How have plant personnel been trained to accomplish this without incident? Please describe in more detail.*

Response: Nuclear process operators at the PFP are extensively trained in operations involving the handling of plutonium; the PFP's primary mission since its startup in 1949 has been the safe handling, processing, and storage of plutonium-bearing materials.

In addition to this broad base of experience and training, specific training packages were developed for the operation of the sludge stabilization process. The operator training consisted of both classroom training and on-the-job training. The classroom training assured that the operators understand the hazards and principles behind sludge stabilization. The on-the-job training involved having the operators actually operate the equipment without plutonium-bearing feed. Drills were prepared and run to assure the operators could respond to upset conditions.

9. *(Section 5.4.1 Accident Scenario) -- This section discusses the potential accident scenario related to flammable gas (i.e., butane [sic]) deflagration. Additional discussion is needed on operational readiness review related to having the equipment perform as it would if operational. The results of such reviews would lend credibility to the probability percentage (0.00001) of an accident occurring.*

Response: The safety analysis in the EA assumes a failure of four safety barriers which assure worker safety from a butane deflagration (see response to item #10 below). The probability of occurrence described in the EA includes a factor to account for the failure potential of the equipment. The operation of the equipment is monitored continually by operators and functionally tested annually by trained and certified technicians.

The readiness assessment was performed by a board of personnel that included both Safety and Quality Assurance personnel. The board assured that all equipment was installed and functioning properly. The board also assured that all documentation was in place and all operator training had been completed. The assessment was overviewed by DOE-HQ, DOE-RL, and MACTEC (an independent contractor): The Defense Nuclear Facilities Safety Board (DNFSB) also performed an independent review of the preparations.

10. *The EA indicates that butane in the furnace offgas will not reach its lower flammability limit (LFL). As most offgas systems are designed to use below the 25 percent of the LFL, allowing a level below, but near, the LFL may not be adequate.*

Response: Under normal conditions, levels of butane in the furnace offgas are projected to remain below 15% of the Lower Flammability Level (LFL) (WHC-SD-CP-OCD-040, Rev. 0-A, "Basis Document for Sludge Stabilization"). There are four safety barriers that are in place to assure worker safety from a deflagration of a flammable gas (butane). Loss of any single barrier will not make the system unsafe. The four barriers are 1) sampling materials to be processed for tributyl phosphate (TBP, which generates butane when heated) and limiting the TBP to 10 grams; 2) holding the temperature below the flammability point (250°C) until all TBP has reacted; 3) providing a carbon dioxide purge to the furnace to dilute any butane generated; and 4) using an exhaust system to remove gases so they do not build up in the furnace. The combination of these safety barriers are designed to assure the butane concentrations stay below 25% of the LFL.

Permits and Regulatory Requirements

11. *Ecology also notes that A Notice of Construction air permit is required for the two new muffle furnaces and was not clearly addressed (page 6-1).*

Response: In a meeting with Washington Department of Health personnel on June 12, 1994, it was determined that a Notice of Construction is not required for this project because it does not constitute a new activity at the facility. The facility has operated a similar process using sludge stabilization furnaces in the past.

Alternative Options

12. *The disposal alternative has not been thoroughly explored or explained in sufficient detail to exclude it as a viable alternative. The worker radiation exposure is less than the proposed alternative, and has the attractiveness of dispositioning the plutonium in a form from which the plutonium would be difficult to recover.*

Response: The quantity and attractiveness categorization of the materials is such that in accordance with DOE Order 5633.3A, "Control and Accountability of Nuclear Materials," the sludge items are considered to be a Category II quantity of Attractiveness Level D material. This type of material requires safeguards to prevent unauthorized diversion or theft. In accordance with the referenced order, this category of material is also not eligible for disposition as waste unless a vulnerability assessment demonstrates that there is not a risk of diversion or theft.

There are several additional factors which make the disposal of the reactive sludge items unattractive. As discussed in the response to item #3, it would be premature to treat the materials in a manner which may be inconsistent with their ultimate disposition. The items would also utilize an substantial portion of the available waste storage capacity onsite.

It should be noted that serious consideration has been given to the disposal alternative. An evaluation of the sludge items was performed to determine whether some of the items could meet disposal criteria. In May of 1994, thirty-three items containing a minimal amount of plutonium, which were initially proposed for thermal stabilization, were determined to be discardable under existing policies and procedures. These items were cemented and sent to 20-year retrievable storage for eventual disposition in the Waste Isolation Pilot Plant.

13. *The EA should provide more detail about why 250 drums would occupy 60 percent of the capacity of the Central Waste Complex. Is the capacity problem related to curie content or volume of drums?*

Response:

As discussed in the EA, section 3.2, the Central Waste Complex capacity is limited based on the curie content of the drums.

14. *The 250 drums would use only 12.5 percent of the Transuranic Waste Storage and Assay Facility's capacity. Which USDOE directives do not allow this amount and classification of special nuclear material to be stored at TRUSAF? Please provide a reference or citation documenting this statement.*

Response: See response to items #12 and #13 above.

15. *We recommend that a working group be established with a strategy for reviews to more clearly reflect the concerns of the State of Washington on this important issue.*

Response:

Refer to item #6 for a discussion of workshops and briefings held to date.

For the purposes of the stabilization of reactive plutonium-bearing sludge items at the PFP, it is the DOE's position that the extensive public and regulatory participation process which was used to help develop the Sludge Stabilization EA has been responsive in addressing the stated concerns of stakeholder, regulatory, and tribal interests.

It is apparent that continued and increased participation by the regulatory agencies and other interested parties will be beneficial in achieving the DOE's goals of stabilizing the process areas within the PFP and determining the ultimate disposition of plutonium items stored throughout the DOE Complex. Opportunities for this interaction will include scoping meetings for both the PFP EIS and the PEIS, as well as briefings and workshop sessions as needed.

FINDING OF NO SIGNIFICANT IMPACT
FOR SLUDGE STABILIZATION AT THE
PLUTONIUM FINISHING PLANT
HANFORD SITE, RICHLAND, WASHINGTON

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact

SUMMARY: The U.S. Department of Energy (DOE) has prepared an environmental assessment (EA) DOE/EA-0978 to assess potential environmental impacts from sludge stabilization at the Plutonium Finishing Plant on the Hanford Site. Alternatives considered in the review process were: the No Action alternative; discarding the sludge as waste and placing it in drum storage for future disposal; processing the material more extensively using the historic purifying production type processing or vitrification for long-term isolation; and the preferred alternative of drying the sludges in muffle furnaces and storage of the dried sludge in PFP vaults. Based on the analysis in the EA, and considering preapproval comments from the State of Washington and the Confederated Tribes of the Umatilla Indian Reservation, DOE has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.). Therefore, the preparation of an Environmental Impact Statement (EIS) is not required.

ADDRESSES AND FURTHER INFORMATION:

Single copies of the EA and further information about the proposed action are available from:

Mr. O. A. Farabee, Acting Director
Transition Programs Division
U.S. Department of Energy
Richland Operations Office
P. O. Box 550
Richland WA 99352
Phone: (509) 376-8089

For further information regarding the DOE NEPA process, contact:

Ms. Carol M. Borgstrom, Director
Office of NEPA Oversight
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585
Phone: (202) 586-4600 or (800) 472-2756

PURPOSE AND NEED: DOE needs to reduce worker exposure to radiation from plutonium sludges stored at the PFP. Currently, PFP workers account for nearly half of all Hanford Site radiation exposure to workers.

BACKGROUND: The PFP began operations in 1949 to convert plutonium nitrate solutions into plutonium metal. This activity continued through 1988. The sludges are residues remaining from these production processing operations. The sludges contain approximately 25 kilograms (55 pounds) of plutonium along with other chemicals in a slurry with high moisture content.

The action to reduce the worker exposure by stabilizing the sludges in the gloveboxes is an interim action (consistent with 40 CFR 1506.1) pending completion of an environmental impact statement (EIS) concerning the proposed cleanout and stabilization of the remaining reactive materials within the PFP. This action will not limit the choice of reasonable alternatives or prejudice the Record of Decision for that EIS.

PROPOSED ACTION: The proposed action is to stabilize the chemically reactive plutonium-bearing sludges within the process gloveboxes in the PFP, and store the stabilized sludges in shielded storage vaults in the PFP.

The sludges would be stabilized by heating the sludges to approximately 500^0 to 1000^0C (900 to 1800^0F) and converting them to plutonium oxide (PuO_2). The other chemicals not driven off by the heat would remain as stable impurities in the resulting solid. The solid PuO_2 would be stored in sealed containers in the vaults at PFP. There are approximately 300 containers of reactive scrap sludges which require stabilization. These contain a total of 25 kilograms (55 pounds) of plutonium.

The process will use two 4000-watt laboratory-size muffle furnaces installed in glovebox HC-21C located in room 230A of building 234-5Z within the PFP. Sludge stabilization is expected to take about 14 months.

ALTERNATIVES TO THE PROPOSED ACTION:

No Action: The No-Action Alternative consists of not stabilizing the plutonium bearing material at this time. The material would continue to be stored in the process gloveboxes. The workers would continue to receive radiation doses during required glovebox operations. The PFP workers would continue to receive approximately 4 person-rem per year from storage of the sludge, and the glovebox space would not be made available for future cleanout. No Action does not meet the need for agency action.

Disposal Alternative: Another alternative would be to dispose of the material as a waste before a final decision has been made regarding the ultimate disposition of the material. Disposal of fissile materials is not allowable under DOE Order 5633.3A, Control and Accountability of Nuclear Materials. However, if allowable, the most likely disposal process for these solid sludges would be to cement the solids in a form that meets Waste Isolation Pilot Plant (WIPP) disposal criteria. The process would involve diluting the materials, mixing them with a concrete material, then pouring the mixture into 0.5-liter (1-pint) containers. The containers would be packaged in 208-liter (55-gallon) drums for storage.

The 250 drums required to contain the cemented material would be stored on the Hanford Site pending future decisions on waste disposal. Because of its high curie content, the waste would use approximately 60 percent of the total waste storage curie capacity within the Central Waste Complex. The 224-T Transuranic Waste Storage and Assay Facility (TRUSAF), which does not have a curie limit, has sufficient space to accept the drums. This alternative, if it were allowable, would use a large amount of the existing storage space in either the 224-T TRUSAF or the Central Waste Complex.

Processing Alternative: Several processing alternatives were considered that could stabilize the sludge. These include operating the Plutonium Reclamation Facility or vitrifying the sludges. Some of these alternatives are technically viable however, they are more expensive than the proposed action, are similar to past defense production processing, may make the stabilized material more difficult to work with in the future, and would expose the operating staff to substantially higher doses of radiation. The sludges would still need constant handling with continued worker exposure while the process is developed and prepared. Therefore the processing alternatives do not meet the need for agency action.

Offsite Treatment and Storage of Sludges Alternative: An alternative that would meet the need for the proposed action would involve transporting the sludges to an offsite facility for treatment and disposal. However, existing regulations prohibit offsite transport of unstabilized fissile materials. Also the transportation of this material on public roads would require packaging not yet developed to meet transportation requirements (49 CFR 173.416 and 173.417). Accordingly, this alternative was dismissed from further consideration.

ENVIRONMENTAL IMPACTS:

Operational Impacts: Routine sludge stabilization operations would result in small airborne chemical or radioactive emissions, indistinguishable from historic releases from PFP. Impacts from these emissions are expected to be extremely small. For example, in 1983, PFP contributed a collective dose of 0.0367 person-rem to the offsite public. This dose would be expected to result in about 0.000018 cancer fatalities among members of the public (i.e., no cancer fatalities). The proposed action would result in a reduction of approximately 4 person-rem per year for all PFP operators. However, the proposed action would result in radiation exposure to the workers when they perform operations involving close proximity to the sludges. The cumulative dose to the workers would be 17 person-rem for the duration of the stabilization action. This would result in an estimated health effect of approximately 0.007 cancer fatalities for the directly exposed workers. Radiation exposure to each operations worker is limited to no more than 2.0 rem per year, with administrative dose controls and an individual monitoring program which provides hold points starting at a cumulative exposure to any worker of 0.5 rem.

Sludge stabilization would generate a small amount of radioactive solid waste. The volume of waste is estimated to be 0.01 cubic meter (0.5 cubic foot) per day. This waste represents a small incremental increase in the total amount of waste generated daily at the Hanford Site. The waste would be stored or disposed at the Hanford Central Waste Complex.

Socioeconomic Impacts: The proposed action would be performed by the existing workforce. Therefore no socioeconomic impact is expected.

Cumulative Impacts: The proposed sludge stabilization at PFP would not have a substantial cumulative effect when considered with other activities on the Hanford Site. The incremental impact of the emissions from the sludge stabilization would be very small.

Potential Accidents: Two potential accidents were analyzed for the sludge stabilization process: a major fire in the glovebox and a flammable gas deflagration. Both accidents have a probability of occurrence of 1×10^{-5} or less. The estimated probability for either accident leading to a release of radioactive materials is the same, and the consequences from the flammable gas accident would be slightly higher; therefore, this was evaluated as the bounding accident. Flammable gas (i.e., butene) would be generated during sludge stabilization operations due to the presence of tributyl phosphate (TBP) in certain feedstocks. It is assumed that twice the control level of TBP is present, the normal inert covergas is absent, the furnace offgas system is blocked, and the controller fails in such a manner that all of butene potentially available is evolved instantaneously. The butene is assumed to form a flammable mixture in the glovebox and ignite. The resultant deflagration is conservatively assumed to breach the glovebox releasing material into the surrounding room, and releasing 0.048 grams (0.0001 pounds) of plutonium from the PFP stack. The committed effective dose equivalent for this potential accident would be 3.58 person-rem (0.0015 latent cancer fatalities) for the PFP workers and 21.5 person-rem (0.011 latent cancer fatalities) for the offsite public. It is most likely that none of the accidents analyzed would produce any cancer fatalities.

DETERMINATION: Based on the analysis in the EA, and after considering the preapproval comments of the State of Washington and the Confederated Tribes of the Umatilla Indian Reservation, I conclude that the proposed sludge stabilization does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of NEPA. Therefore, an EIS for the proposed action is not required.

Issued at Richland, Washington, this 19th day of October, 1994.

John D. Wagoner
John D. Wagoner
Manager
Richland Operations Office

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